

# PATENT ABSTRACTS OF JAPAN

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(71)Applicant : DAINIPPON SCREEN MFG CO LTD

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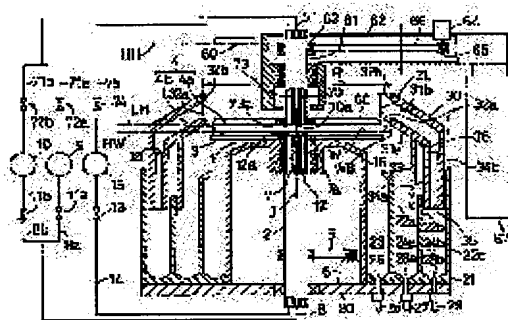
(72)Inventor : ADACHI HIDEKI

## (54) SUBSTRATE-PROCESSING SYSTEM

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To enhance the finishing accuracy of a processing by suppressing re-adhesion of processing liquid to a substrate.

**SOLUTION:** A guide member 30 is disposed movably vertically, while surrounding a substrate W held by a spin chuck 1. Inclining sections 31a, 31b having a diameter decreasing gradually upward are formed on the inner wall face of the guide member 30 with gas intake ports 32a, 32b formed at the upper end thereof. An atmosphere-shielding member 60 is disposed above the spin chuck 1, such that it can approach the spin chuck 1 or freely recede therefrom. The substrate W is processed by locating the inclining sections 31a (31b) of the guide member 30 at the height HW of the substrate W held by the spin chuck 1, setting the interval between the upper surface of the substrate W held by the spin chuck 1 and the atmosphere-shielding member 60 at WB and closing the central part of the gas intake ports 32a (32b) with the atmosphere-shielding member 60.



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## CLAIMS

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[Claim(s)]

[Claim 1]A substrate processing device comprising:

A substrate holding means which holds a substrate by a horizontal position.

A substrate rotation means to rotate a substrate held at said substrate holding means by a circumference of an axis of the perpendicular direction.

It has an internal surface which is provided so that a substrate held at said substrate holding means may be surrounded, and catches a treating solution which disperses from a substrate which rotates by said substrate rotation means and to which it shows a downward discharge port, A guidance member in which a gas incorporation mouth which incorporates a gas into an upper bed part of the inclined part is formed while an inclined part to which a path becomes small is formed in said internal surface so that it goes up.

An exhaust port which exhausts a gas which said substrate holding means was established caudad and incorporated with said gas incorporation mouth, It is arranged above said substrate holding means, and has a path smaller than a gas incorporation mouth of said guidance member, An atmosphere blocking member provided with a treating solution feed zone which supplies a treating solution near the center of rotation on said upper surface of a substrate from an opposed face which counters the upper surface of a substrate held at said substrate holding means, An ascending and descending means which makes it go up and down relatively said substrate holding means and said guidance member, An attachment-and-detachment means to make said atmosphere blocking member attach and detach relatively to said substrate holding means, A rise-and-fall control means which controls said ascending and descending means so that an inclined part of said guidance member is located in a height position of a substrate held at said substrate holding means, when processing a substrate with a treating solution, An attachment-and-detachment control means which controls said attachment-and-detachment means to arrange the upper surface of a substrate and a prescribed interval partition \*\*\*\*\* atmosphere blocking member which were held at said substrate holding means when processing a substrate with a treating solution.

[Claim 2]The substrate processing device comprising according to claim 1:

An exhaust air tub which established said exhaust port in a pars basilaris ossis occipitalis.

An effluent tub which was provided in the circumference of said exhaust air tub, and provided said discharge port in a pars basilaris ossis occipitalis.

[Claim 3]In the substrate processing device according to claim 1, a treating solution feed zone with which said atmosphere blocking member was equipped, Selectively, two or more kinds of treating solutions are constituted so that supply is possible, and said guidance member, While two or more inclined parts corresponding to a treating solution of several kinds which opened an interval mutually and were arranged concentrically are formed, A discharge port is provided under the effluent guide flow path formed in a lower part of innermost inclined part, and a crevice between each inclined part, respectively, and a path of a gas incorporation mouth of an upper bed part of each inclined part -- abbreviated -- it being formed similarly and said rise-

and-fall control means, A substrate processing device controlling said ascending and descending means so that an inclined part of said guidance member corresponding to a kind of treating solution supplied to the substrate is located in a height position of a substrate held at said substrate holding means.

[Claim 4]The substrate processing device comprising according to claim 3:

An exhaust air tub which established said exhaust port in a pars basilaris ossis occipitalis.

Two or more effluent tubs corresponding to a treating solution of several kinds which were concentrically provided in the circumference of said exhaust air tub, and provided a discharge port in a pars basilaris ossis occipitalis, respectively.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention, rotating substrates, such as a glass substrate for a semiconductor wafer or liquid crystal displays, a glass substrate for photo masks, and a substrate for optical discs, by the circumference of the axis of the perpendicular direction in the state where it held to the horizontal position. Treating solutions, such as a penetrant remover, are supplied to a substrate, and it is related with the substrate processing device which performs processing of predetermined [, such as washing processing, ] to a substrate.

[0002]

[Description of the Prior Art]An example of this conventional kind of substrate processing device is shown in drawing 9. The device shown in drawing 9 is a device for performing washing processing which used a drug solution and pure water for the substrate.

A drug solution and waste fluid were separated and it has the function which carries out an effluent.

[0003]The spin chuck 100 pivotable at the circumference of the axis of the perpendicular direction after this device has carried out adsorption maintenance of the substrate W by the horizontal position, The motor 102 for carrying out the high velocity revolution of the spin chuck 100 via the axis of rotation 101, The rising and falling mechanism 103 which makes it go up and down the spin chuck 100, and the cup 104 which surrounds the substrate W to process and forms the processing chamber 104a, It has the penetrant remover nozzles 105a, 105b, 105c, and 105d for supplying penetrant removers, such as a drug solution and pure water, from the slanting upper part or a slanting lower part to the substrate W.

[0004]The discharge port 106 which carries out the effluent of the penetrant remover after being used for washing of the substrate W is formed in the pars basilaris ossis occipitalis of the cup 104. During processing, the internal surface of this cup 104 catches the penetrant remover which disperses from the rotating substrate W, and guides the discharge port 106. The gas incorporation mouth 107 which incorporates a gas is formed in the upper bed part of the cup 104. Although this kind of substrate processing device is installed in a clean room, in the clean room, the pure gas is flowing down by the downflow towards the floor line from the ceiling. The pure gas of this downflow is incorporated into the processing chamber 104a in the cup 104 from the gas incorporation mouth 107, and it exhausts from the exhaust port 108 established in the cup 104, and it is constituted so that the mist etc. of the penetrant remover which floats in the processing chamber 104a may be discharged.

[0005]The approximate circle board-like gutter material 110 which has the gutter 109 of the ring shape which counters the discharge port 106 under the cup 104 is attached to the protective tube 111 which surrounds the axis of rotation 101, enabling free rotation. The effluent flowing-down mouth 112 is formed in one predetermined place of the pars basilaris ossis occipitalis of the gutter 109. The ring gear 113 is being fixed to the periphery of the gutter material 110, and the driving gear 115 attached to the driving shaft of the motor 114 is engaging to this ring gear 113. a guttering -- the abandonment drain 116 for discarding the waste fluid after [ the member

110 ] being further used for washing processing below, and the recovery drain 117 for collecting drug solutions are formed. By such composition, the effluent flowing-down mouth 112 of the gutter material 109 can be selectively located above either the abandonment drain 116 or the recovery drain 117 by driving the motor 114.

[0006]The device operates as follows conventionally [ this ]. First, the spin chuck 100 goes up, and the unsettled substrate W is received and passed to the spin chuck 100 in the state where it projected from the upper part of the cup 104, from the carrier robot which does not illustrate. The spin chuck 100 which received the substrate W descends according to the rising and falling mechanism 103, and the substrate W is located in the processing chamber 104a. And the substrate W rotates with the spin chuck 100, a drug solution is supplied to the substrate W from the penetrant remover nozzles 105a-105d, and washing processing by a drug solution is performed to the substrate W. In the case of this chemical washing processing, a drug solution is recoverable for reuse by locating the effluent flowing-down mouth 112 above the recovery drain 117. If predetermined chemical washing processing time passes, the penetrant remover supplied from the penetrant remover nozzles 105a-105d to the substrate W will be switched to pure water from a drug solution, and rinsing treatment which washes out the drug solution adhering to the substrate W with pure water will be performed to the substrate W. In the case of this rinsing treatment, the waste fluid (pure water with which the drug solution was mixed) after being used for washing processing can be discarded by locating the effluent flowing-down mouth 112 above the abandonment drain 116. If predetermined rinsing treatment time passes, supply of the pure water from the penetrant remover nozzles 105a-105d will be suspended, and the pure water which rotated the substrate W as it is and has adhered to the substrate W will be shaken off and dried. After finishing desiccation of the substrate W, rotation of the spin chuck 100 is suspended. And the spin chuck 100 goes up according to the rising and falling mechanism 103, the carrier robot which does not illustrate receives the substrate W washing processed from the spin chuck 100 in the state where it projected from the upper part of the cup 104, and the washing processing to the one substrate W is completed.

[0007]

[Problem(s) to be Solved by the Invention]However, the substrate W after washing conventionally washed with a device may be polluted, and, as for a device, there was a problem in the finishing precision of washing conventionally. When this invention person investigated this inconvenience, he traced being based on a following cause.

[0008]That is, when this invention person analyzed the flow of the gas in the processing chamber 104a of a device by the simulation conventionally, it became clear that the convection of the air current had occurred in the lower part field 200 of the spin chuck 100. It hits the internal surface of the cup 104, the part serves as misty state mist, and the penetrant remover which disperses on the other hand from the substrate W which rotates during processing floats in the processing chamber 104a. Although the mist of this penetrant remover should be essentially exhausted from the exhaust port 108, It flows backwards to the substrate W side by the convection of the air current in the lower part field 200 of the spin chuck 100, the mist of a penetrant remover carries out the reattachment to the substrate W during desiccation of the substrate W or after the end, and it is thought that the substrate W after washing was polluted.

[0009]Since his interval between the substrate W held at the spin chuck 100 and the internal surface of the cup 104 is large when this invention person investigates the cause by which an air current convects in the lower part field 200 of the spin chuck 100 further, From the opening part, the rate of flow of the gas which flows in the processing chamber 104a becomes slow, and to eye others. It flowed into the lower part field 200 of the spin chuck 100, without exhausting a part of air current in the processing chamber 104a from the exhaust port 108, and it became clear by the simulation to have produced the convection of the air current there.

[0010]Then, if the cup 104 is designed, bring the internal surface of the cup 104 close to the substrate W held at the spin chuck 100 for example, it will be thought that the convection of the air current in the lower part field 200 of the spin chuck 100 can be abolished. However, when the penetrant remover which dispersed from the rotating substrate W hits the internal surface of the cup 104, the part rebounds upon the substrate W side, but. If the internal surface of the cup 104

is brought close to the substrate W held at the spin chuck 100, it will become easy to carry out the reattachment of the penetrant remover which has rebounded from the internal surface of the cup 104 to the substrate W, and it will pollute the substrate W on the contrary.

[0011]When supplying a predetermined treating solution to a substrate and performing predetermined processing to a substrate, rotating a substrate, it is generally known that the finishing precision of processing will worsen because a treating solution carries out the reattachment to a substrate. therefore, the above on the equipment configuration which contains a cup etc. also in the substrate treatment of not only washing processing but others -- the problem in which a treating solution carries out the reattachment to a substrate may arise for the same reason as a device conventionally.

[0012]Although the device separated a drug solution and waste fluid and is conventionally provided with the function which carries out an effluent, The course from the cup 104 to the effluent flowing-down mouth 112 of the gutter material 110 through the discharge port 106 was used in common with the drug solution for recovery, and the waste fluid for abandonment, mixing of 2 liquid in this course could not be avoided, but the composition of the device of the separation effluent of a drug solution and waste fluid was conventionally insufficient.

[0013]This invention is made in view of such a situation, controls the reattachment of the treating solution to a substrate, and makes it a key objective to provide the substrate processing device which can raise the finishing precision of substrate treatment.

[0014]In the device provided with the function which carries out the separation waste fluid of two or more kinds of treating solutions used for processing, another purpose of this invention is to attain the above-mentioned key objective suitably.

[0015]In the device provided with the function which carries out the separation waste fluid of two or more kinds of treating solutions used for processing, there is another purpose of this invention in providing the device which can also perform suitably the separation waste fluid of two or more kinds of treating solutions used for processing while attaining the above-mentioned key objective suitably.

[0016]

[Means for Solving the Problem]This invention takes the following composition, in order to attain such a purpose. That is, the invention according to claim 1 is provided with the following.

A substrate holding means which holds a substrate by a horizontal position.

A substrate rotation means to rotate a substrate held at said substrate holding means by a circumference of an axis of the perpendicular direction.

It has an internal surface which is provided so that a substrate held at said substrate holding means may be surrounded, and catches a treating solution which disperses from a substrate which rotates by said substrate rotation means and to which it shows a downward discharge port, While an inclined part to which a path becomes small is formed in said internal surface so that it goes up, A guidance member in which a gas incorporation mouth which incorporates a gas into an upper bed part of the inclined part is formed, An exhaust port which exhausts a gas which said substrate holding means was established caudad and incorporated with said gas incorporation mouth, It is arranged above said substrate holding means, and has a path smaller than a gas incorporation mouth of said guidance member, An atmosphere blocking member provided with a treating solution feed zone which supplies a treating solution near the center of rotation on said upper surface of a substrate from an opposed face which counters the upper surface of a substrate held at said substrate holding means, An ascending and descending means which makes it go up and down relatively said substrate holding means and said guidance member, An attachment-and-detachment means to make said atmosphere blocking member attach and detach relatively to said substrate holding means, A rise-and-fall control means which controls said ascending and descending means so that an inclined part of said guidance member is located in a height position of a substrate held at said substrate holding means, when processing a substrate with a treating solution, and when a substrate is processed with a treating solution, An attachment-and-detachment control means which controls said attachment-and-detachment means to arrange the upper surface of a substrate and a prescribed interval partition \*\*\*\*\* atmosphere blocking member which were held at said

substrate holding means.

[0017]In a substrate processing device given in above-mentioned claim 1 the invention according to claim 2, Allocate a receptacle member provided with an exhaust air tub which established said exhaust port in a pars basilaris ossis occipitalis, and an effluent tub which was provided in the circumference of said exhaust air tub, and provided said discharge port in a pars basilaris ossis occipitalis under said substrate holding means, and said ascending and descending means, You make it go up and down said guidance member to said substrate holding means and said receptacle member.

[0018]A treating solution feed zone by which said atmosphere blocking member was equipped with the invention according to claim 3 in a substrate processing device of a statement at above-mentioned claim 1, Selectively, two or more kinds of treating solutions are constituted so that supply is possible, and said guidance member, While two or more inclined parts corresponding to a treating solution of several kinds which opened an interval mutually and were arranged concentrically are formed, A discharge port is provided under the effluent guide flow path formed in a lower part of innermost inclined part, and a crevice between each inclined part, respectively, and a path of a gas incorporation mouth of an upper bed part of each inclined part -- abbreviated -- it being formed similarly and said rise-and-fall control means, Said ascending and descending means is controlled so that an inclined part of said guidance member corresponding to a kind of treating solution supplied to the substrate is located in a height position of a substrate held at said substrate holding means.

[0019]In a substrate processing device given in above-mentioned claim 3 the invention according to claim 4, It is concentrically provided in the circumference of an exhaust air tub which established said exhaust port in a pars basilaris ossis occipitalis, and said exhaust air tub, A receptacle member provided with two or more effluent tubs corresponding to a treating solution of several kinds which provided a discharge port in a pars basilaris ossis occipitalis, respectively was allocated under said substrate holding means, and said ascending and descending means was constituted so that you might make it go up and down said guidance member to said substrate holding means and said receptacle member.

[0020]

[Function]The operation of the invention according to claim 1 is as follows. If a substrate is held at a substrate holding means, a rise-and-fall control means will control the ascending and descending means which makes it go up and down a substrate holding means and a guidance member relatively so that the inclined part of a guidance member is located in the height position of the substrate held at the substrate holding means. On the other hand, an attachment-and-detachment control means controls an attachment-and-detachment means to make an atmosphere blocking member attach and detach relatively to a substrate holding means so that the upper surface of a substrate and the prescribed interval partition \*\*\*\*\* blocking member which were held at the substrate holding means may be arranged.

[0021]And by a substrate rotation means, while the substrate held at the substrate holding means rotates by the circumference of the axis of the perpendicular direction, a treating solution is supplied near the center of rotation on the upper surface of a substrate from the treating solution feed zone with which the atmosphere blocking member was equipped, and predetermined processing is performed to a substrate.

[0022]At this time, most treating solutions which dispersed from the rotating substrate are caught by the inclined part of a guidance member, and it is guided along with an inclined part at a downward discharge port. Some treating solutions which hit a part of inclined part serve as misty state mist, and it will float to the space inside the internal surface of a guidance member.

[0023]However, the center portion of the gas incorporation mouth of a guidance member will be closed by the atmosphere blocking member by which prescribed interval partition \*\*\*\*\* was carried out from the upper surface of the substrate. Therefore, in the space inside the internal surface of a guidance member. The rate of flow of the gas which flows into the exhaust port which a gas will flow from the slit between the gas incorporation mouth of a guidance member and an atmosphere blocking member, flowed from the crevice, and flowed down the

circumference of a substrate, and in which the substrate holding means was provided caudad becomes comparatively quick, and a gaseous convection becomes difficult to occur in the lower part space of a substrate holding means. Since the air current which flows down the circumference of a substrate will achieve the duty of an air curtain, it can also control that the mist of the treating solution which floats to the exterior of the air curtain flows into the substrate side inside the air curtain. Since the reattachment to the substrate of the mist of a treating solution can be controlled, it is not necessary to design a device bring the inclined part of a guidance member close to the substrate held at the substrate holding means more than needed. Since the treating solution which dispersed from the rotating substrate is caught by the inclined part to which a path becomes small so that it goes up, most treating solutions will go caudad, it will rebound and can lessen the rebound phenomenon of the treating solution by the side of a substrate. Therefore, the reattachment of the treating solution to a substrate can be controlled suitably.

[0024]According to the invention according to claim 2, the gas which flowed from the crevice between the gas incorporation mouth of a guidance member and an atmosphere blocking member flows down the circumference of a substrate, and is exhausted through the exhaust air tub which constitutes the receptacle member allocated under the substrate holding means from the exhaust port established in the pars basilaris ossis occipitalis of the exhaust air tub. The effluent of the treating solution which dispersed on the other hand from the rotating substrate is carried out through the effluent tub provided in the circumference of the exhaust air tub along with the inclined part of a guidance member from the discharge port provided in the pars basilaris ossis occipitalis of the effluent tub. Since the mist of the treating solution by which hit the inclined part of the guidance member and it was generated floats in an effluent tub, the reattachment to the substrate of the mist becomes much more difficult to occur.

[0025]The ascending and descending means is constituted so that you may make it go up and down a guidance member to a substrate holding means and a receptacle member, and in control by a rise-and-fall control means. It is made to go up and down a guidance member to a substrate holding means and a receptacle member, and the height of the guidance member to a substrate holding means is controlled so that the inclined part of a guidance member is located in the height position of the substrate held at the substrate holding means.

[0026]According to the invention according to claim 3, an ascending and descending means is controlled by a rise-and-fall control means so that the inclined part of the guidance member corresponding to the kind of treating solution supplied to the substrate after this is located in the height position of the substrate held at the substrate holding means. And from the treating solution feed zone with which the atmosphere blocking member was equipped, the treating solution corresponding to the inclined part is supplied to a substrate, and processing is performed to a substrate. Along with the inclined part of the guidance member corresponding to the treating solution, the effluent of the treating solution supplied to the substrate is carried out from the individual discharge port of the lower part.

[0027]When supplying and processing another kind of treating solution to a substrate, An ascending and descending means is controlled by a rise-and-fall control means so that the inclined part of the guidance member corresponding to the another kind of treating solution is located in the height position of the substrate held at the substrate holding means, from the treating solution feed zone with which the atmosphere blocking member was equipped, the another kind of treating solution is supplied to a substrate, and processing is performed to a substrate. Along with the inclined part of the guidance member corresponding to that treating solution, the effluent of this another kind of treating solution is carried out from the individual discharge port of that lower part.

[0028]Therefore, the effluent of two or more kinds of treating solutions used for processing can be separated and carried out. And since the atmosphere blocking member is arranged in the upper part held at the substrate holding means on the occasion of processing by the treating solution of several kinds, the reattachment of various kinds of treating solutions to a substrate can be suitably controlled by the same operation as the invention according to claim 1.

[0029]the path of the gas incorporation mouth of the upper bed part of each inclined part --



abbreviated -- since it is similarly formed -- the crevice between each gas incorporation mouth of a guidance member, and an atmosphere blocking member -- all the gas incorporation mouths -- abbreviated -- similarly it can do, and gaseous inflow conditions can be made the same and can also be processed.

[0030] Since the effluent of the treating solution of several kinds is carried out by the separate inclined part, the effluent guide flow path, and a discharge port, each liquid is mixed, an effluent is not carried out and the separation effluent of each liquid can also be performed suitably.

[0031] According to the invention according to claim 4, to a receptacle member. The treating solution which dispersed from the substrate which two or more effluent tubs corresponding to the treating solution of several kinds which provided the discharge port in the pars basilaris ossis occipitalis, respectively are concentrically provided in the circumference of the exhaust air tub, and rotate, Along with the inclined part of the guidance member corresponding to the treating solution, an effluent is carried out through the effluent tub corresponding to the treating solution from the discharge port provided in the pars basilaris ossis occipitalis of the effluent tub.

[0032] Like the invention according to claim 2, the ascending and descending means is constituted so that you may make it go up and down a guidance member to a substrate holding means and a receptacle member, and in control by a rise-and-fall control means. It is made to go up and down a guidance member to a substrate holding means and a receptacle member, and an ascending and descending means is controlled so that the inclined part of the guidance member corresponding to the kind of treating solution supplied to a substrate is located in the height position of the substrate held at the substrate holding means.

[0033]

[Embodiment of the Invention] Hereafter, an embodiment of the invention is described with reference to drawings. Drawing 1 is drawing of longitudinal section showing the composition of the substrate processing device concerning one embodiment of this invention. This device is for performing washing processing which used a drug solution and pure water for semiconductor wafer (substrate) W of the processing object.

A drug solution and waste fluid were separated and it has the function which carries out an effluent.

[0034] The substrate W is held by a horizontal position at the spin chuck 1 as a substrate holding means. This spin chuck 1 has the spin base 3 really attached to the upper bed of the axis of rotation 2 pivotable. The three or more substrate attachment components 4 which hold the peripheral part of the substrate W at three or more places are set up at equal intervals along with the periphery of the spin base 3 by the upper surface of the spin base 3. Below by drawing 1, in order to avoid that a drawing becomes complicated, only the one substrate attachment component 4 is shown.

[0035] Each substrate attachment component 4 is provided with the substrate attaching part 4b which presses the peripheral end face of the substrate W supported by the substrate supporting part 4a which supports the peripheral part of the substrate W from a lower part, and the substrate supporting part 4a, and holds the substrate W. Each substrate attachment component 4 comprises a holding state in which the substrate attaching part 4b presses the peripheral end face of the substrate W, and a non-holding state in which the substrate attaching part 4b separates from the peripheral end face of the substrate W so that a change is possible. The change with this holding state and a non-holding state is realized by the link mechanism etc. which were indicated by JP,3-9607,B, for example.

[0036] When the interlocking linkage of the electrical motor 6 as a substrate rotation means is carried out by the belt transmission mechanism 5 etc. to the lower end vicinity of the axis of rotation 2 and it drives the electrical motor 6 according to them to it, with the axis of rotation 2 and the spin chuck 1. The substrate W held at the spin chuck 1 is rotated by the circumference of the axis J of the perpendicular direction.

[0037] The axis of rotation 2 comprises a tubed member which has hollow, the cleaning liquid supply pipe 7 penetrates to this centrum, and it is constituted so that a penetrant remover can be supplied near the center of rotation of the undersurface of the substrate W held at the spin

chuck 1 from the penetrant remover feed zone 7a of that upper bed part. Free passage connection of the cleaning liquid supply pipe 7 is made at the piping 8. The base end of this piping 8 has branched, free passage connection of the chemical supply source 9 is made at one branch piping 8a, and free passage connection of the pure water supply source 10 is made at the branch piping 8b of another side. The switching valves 11a and 11b are formed in each branch piping 8a and 8b, and by switching opening and closing of these switching valves 11a and 11b, from the penetrant remover feed zone 7a, a drug solution and pure water are switched selectively and can be supplied now.

[0038]The crevice between the internal surface of the centrum of the axis of rotation 2 and the external wall surface of the cleaning liquid supply pipe 7 serves as the gas feed path 12. Free passage connection of this gas feed path 12 is made via the piping 14 in which the switching valve 13 was formed at the gas supply source 15. It is constituted so that pure gases, such as pure air and pure inactive gas (nitrogen gas etc.), can be supplied to the space between the spin base 3 and the undersurface of the substrate W from the gas supply part 12a of the upper bed part of the gas feed path 12.

[0039]The axis of rotation 2, the belt transmission mechanism 5, the electrical motor 6, etc. are accommodated in the cylindrical casing 16 provided on the base member 20.

[0040]It receives in the circumference of the casing 16 on the base member 20, and the member 21 is attached fixed. The cylindrical diaphragms 22a, 22b, and 22c are set up by the receptacle member 21, and the exhaust air tub 23, the 1st effluent tub 24a, and the 2nd effluent tub 24b are formed in it of these diaphragms 22a-22c and the external wall surface of the casing 16. The space between the external wall surface of the casing 16 and the internal surface of the inside diaphragm 22a is the exhaust air tub 23, The space between the external wall surface of the inside diaphragm 22a and the internal surface of the middle diaphragm 22b is the 1st effluent tub 24a, and the space between the external wall surface of the middle diaphragm 22b and the internal surface of the outside diaphragm 22c is the 2nd effluent tub 24b.

[0041]The exhaust port 26 by which free passage connection was made is established in the pars basilaris ossis occipitalis of the exhaust air tub 23 at the exhaust duct 25, and it is constituted so that the gas in the exhaust air tub 23 may be attracted from the exhaust port 26. the 1st discharge port 28a by which free passage connection was made at the pars basilaris ossis occipitalis of the 1st effluent tub 24a at the recovery drain 27 -- providing -- the 2nd discharge port 28b by which free passage connection was made is formed in the abandonment drain 29 at the pars basilaris ossis occipitalis of the 2nd effluent tub 24b.

[0042]Below by drawing 1, in order to avoid that a drawing becomes complicated, each diaphragms 22a-22c and the guidance member 30 mentioned later show only sectional shape.

[0043]The tubed guidance member 30 is formed above the 1st and 2nd effluent tub 24a and 24b, enabling free rise and fall so that the circumference of the substrate W held by the spin chuck 1 and it may be surrounded. The inclined parts 31a and 31b to which a path becomes small are formed in two places, so that it goes to this guidance member 30 up. Each inclined parts 31a and 31b open an interval mutually, and are arranged concentrically. The gas incorporation mouths 32a and 32b which the path R similarly comprised are formed in the upper bed part of each inclined parts 31a and 31b. In the lower end part of the inclined part 31a, the vertical sections 33 and 34a stand in a row, and the vertical section 34b stands in a row in the lower end part of the inclined part 31b. Each inclined parts 31a and 31b are connected via the vertical sections 34a and 34b.

The opening 35 of a large number which form an effluent guide flow path in a circumferential direction is drilled by this joining segment.

While the circular slot 36 is formed between the vertical section 33 and the vertical section 34a and this slot 36 is inserted in the middle diaphragm 22b by the guidance member 30, the guidance member 30 is arranged at it so that the vertical sections 34a and 34b may be inserted in the 2nd waste fluid tub 24b.

[0044]When the inclined part 31a is located in height position HW of the substrate W held at the spin chuck 1, The penetrant remover which disperses from the rotating substrate W will be caught by the inclined part 31a, and will be led to the 1st effluent tub 24a along with the inclined

part 31a and the vertical section 33, and an effluent will be carried out from the 1st discharge port 28a. In this device, the inclined part 31a, the vertical section 33, the 1st effluent tub 24a, and the 1st discharge port 28a are used for recovery of a drug solution, The drug solution which drug solutions were collected from the 1st discharge port 28a to the recovery tank which is not illustrated through the recovery drain 27, and were collected from the recovery tank is supplied to the chemical supply source 9, and a drug solution is reused.

[0045]When the inclined part 31b is located in height position HW of the substrate W held at the spin chuck 1, The penetrant remover which disperses from the rotating substrate W will be caught by the inclined part 31b, and will be led to the 2nd effluent tub 24b from the opening 35 along with the inclined part 31b and the vertical section 34b, and an effluent will be carried out from the 2nd discharge port 28b. In this device, the inclined part 31b, the vertical section 34b, the opening 35, the 2nd effluent tub 24b, and the 2nd discharge port 28b are used for abandonment of the waste fluid (pure water with which the drug solution was mixed) after being used for washing processing, and waste fluid is discarded through the abandonment drain 29 from the 2nd discharge port 28b.

[0046]The composition of an example of a rising and falling mechanism which makes it go up and down the guidance member 30 is explained with reference to drawing 2. The guidance member 30 is supported by the hoisting member 41 via the support member 40. While the screw axis 42 is screwed, the guide rail 43 is inserted in this hoisting member 41, enabling free sliding. By driving the motor 44 connected with the screw axis 42, the hoisting member 41 goes up and down, and the guidance member 30 goes up and down in connection with this. The hoisting member 41, the screw axis 42, the guide rail 43, the motor 44, etc. constitute the rising and falling mechanism 45 equivalent to an ascending and descending means.

[0047]The guidance member 30, The 1st height H1 to which the inclined part 31a is located in height position HW of the substrate W held at the spin chuck 1, The 2nd height H2 to which the inclined part 31b is located in height position HW of the substrate W, and the upper gas incorporation mouth 32b go up and down in the height position of the three-stage of the 3rd height position H3 caudad located rather than height position HW of the substrate W. In the height position of the hoisting member 41 corresponding to the above 1st - the 3rd height position H1-H3 of the guidance member 30. The sensors 46a-46c for hoisting member 41 detection which comprise a reflection type photosensor etc. are allocated, and based on the detecting signal from these sensors 46a-46c, drive controlling of the motor 44 is carried out, and it is constituted so that the guidance member 30 may make it located in the 1st - the 3rd height position H1-H3. As shown in drawing 3, this rise-and-fall control is constituted so that it may be carried out by the control section 50 which functions as a rise-and-fall control means and an attachment-and-detachment control means.

[0048]It returns to drawing 1 and the atmosphere blocking member 60 which has an opening in the central part is arranged above the spin chuck 1. This atmosphere blocking member 60 is really attached to the lower end part of the tubed supporting spindle 61 which has a path smaller than the path R of the gas incorporation mouths 32a and 32b of the guidance member 30, and has hollow a little more greatly than the path of the substrate W pivotable. The supporting spindle 61 is supported by the suspension arm 62, enabling free rotation. The driven pulley 63 is really attached to the supporting spindle 61 pivotable. It is built over the endless belt 66 between the driven pulley 63 and the main driving belt pulley 65 connected with the driving shaft of the motor 64, and by driving the motor 64, it is constituted so that the atmosphere blocking member 60 may rotate to the circumference of the axis J of the perpendicular direction with the supporting spindle 61.

[0049]The suspension arm 62 goes up and down with the attachment-and-detachment mechanism 67 equivalent to an attachment-and-detachment means, and it is constituted so that the atmosphere blocking member 60 may attach and detach to the spin chuck 1 by rise and fall of this suspension arm 62. As for predetermined, in this device, interval WB to the upper surface of the substrate W with which the atmosphere blocking member 60 was held at the spin chuck 1 Separated downward position LH, It is constituted so that the atmosphere blocking member 60 can go up and down the atmosphere blocking member 60 among two steps of positions with the

upper position HH greatly separated from the upper surface of the substrate W held at the spin chuck 1 to the upper part. The attachment-and-detachment mechanism 67 in which such \*\*\*\*\* is realized comprises a mechanism using a screw axis etc., or an air cylinder like the rising and falling mechanism 45. As shown in drawing 3, it is constituted so that this attachment-and-detachment control may also be performed by the control section 50.

[0050]It returns to drawing 1, and the cleaning liquid supply pipe 70 penetrates to the opening of the center of the atmosphere blocking member 60, and the centrum of the supporting spindle 61, and it is constituted so that a penetrant remover can be supplied near the center of rotation of the upper surface of the substrate W held at the spin chuck 1 from the penetrant remover feed zone 70a of the lower end part. Free passage connection of the cleaning liquid supply pipe 70 is made at the piping 71. The base end of this piping 71 has branched, free passage connection of the chemical supply source 9 is made at one branch piping 71a, and free passage connection of the pure water supply source 10 is made at the branch piping 71b of another side. The switching valves 72a and 72b are formed in each branch piping 71a and 71b, and by switching opening and closing of these switching valves 72a and 72b, from the penetrant remover feed zone 70a, a drug solution and pure water are switched selectively and can be supplied now.

[0051]The crevice between the internal surface of the opening of the center of the atmosphere blocking member 60 and the internal surface of the centrum of the supporting spindle 61, and the external wall surface of the cleaning liquid supply pipe 70 serves as the gas feed path 73. Free passage connection is made via the piping 75 in which the switching valve 74 was formed at the gas supply source 15, and this gas feed path 73 is constituted so that a pure gas can be supplied to the space between the atmosphere blocking member 60 and the upper surface of the substrate W from the gas supply part 73a of the lower end part of the gas feed path 73.

[0052]The control section 50 besides rise-and-fall control of the guidance member 30, and attachment-and-detachment control of the atmosphere blocking member 60, It is constituted so that control of the roll control of the spin chuck 1, the roll control of the atmosphere blocking member 60, the supply control of the penetrant remover from the penetrant remover feed zones 7a and 70a, the supply control of the gas from the gas supply parts 12a and 73a, etc. may also be performed.

[0053]Operation of the device which has the above composition is explained with reference to drawing 4 thru/or drawing 6. Drawing 4 shows the state of delivering the substrate W to the spin chuck 1, drawing 5 shows the state of chemical washing processing, and drawing 6 shows the state of rinsing treatment and a drying process.

[0054]First, while locating the guidance member 30 in the 3rd height position H3 and making the spin chuck 1 project from the upper part of the guidance member 30 as shown in drawing 4, the atmosphere blocking member 60 is located in the upper position HH, and the interval between the atmosphere blocking member 60 and the spin chuck 1 is extended. In this state, the carrier robot which does not illustrate hands over the unsettled substrate W to the spin chuck 1. The spin chuck 1 holds the received substrate W.

[0055]While locating the guidance member 30 in the 1st height position H1 and locating the inclined part 31a of the guidance member 30 in height position HW of the substrate W held at the spin chuck 1 as shown in drawing 5 after the receipt of the substrate W finishes, The atmosphere blocking member 60 is located in downward position LH, and the interval between the upper surface of the substrate W and the atmosphere blocking member 60 which were held at the spin chuck 1 is set to WB. By this, the center portion of the gas incorporation mouth 32a of the upper bed part of the inclined part 31a will be closed by the atmosphere blocking member 60. The above-mentioned interval WB is an interval arranged so that the atmosphere blocking member 60 may plug up the center portion of the gas incorporation mouth 32a.

[0056]In this state, the substrate W is rotated with the spin chuck 1, a drug solution is supplied to up-and-down both sides of the substrate W from the penetrant remover feed zones 7a and 70a, and chemical washing processing is performed. The drug solution which is shaken off from the peripheral part of the substrate W which rotates in the case of this chemical washing processing, and disperses around, It will be caught by the inclined part 31a, and will be led to the 1st effluent tub 24a along with the inclined part 31a and the vertical section 33, an effluent will

be carried out from the 1st discharge port 28a, and it will be collected by the recovery tank through the recovery drain 27.

[0057]Some drug solutions which dispersed from the substrate W and hit the inclined part 31a serve as mist, and it will float. However, since the center portion of the gas incorporation mouth 32a of the guidance member 30 is plugged up with this device by the atmosphere blocking member 60 arranged by prescribed-interval-WB-separating from the upper surface of the substrate W, A gas will flow into the space inside the internal surface of the guidance member 30 from the circular slit 80 between the gas incorporation mouth 32a of the guidance member 30, and the atmosphere blocking member 60, The rate of flow of the gas which flows from the crevice 80, flows down the circumference of the substrate W and the spin base 3, and flows into the exhaust port 26 of the lower part of the spin chuck 1 becomes comparatively quick, and a gaseous convection becomes difficult to occur in the lower part space of the spin chuck 1. Since the air current which flows down the circumference of the substrate W will achieve the duty of an air curtain, it is also controlling the mist of the drug solution which floats to the exterior of the air curtain flowing into the substrate W side inside the air curtain. Since a part of air current flows also into the 1st effluent tub 24a, it is washed away by the mist of the drug solution which floats near inclined part 31a according to the air current in the 1st processing tub 24a. Therefore, it can control that the mist of a drug solution carries out the reattachment to the substrate W.

[0058]While the guidance member 30 is arranged so that the substrate W held at the inclined part 31a and the spin chuck 1 of the guidance member 30 may fully be detached, Since the inclined part 31a (31b) of the guidance member 30 is formed so that it goes up and a path may become small, and the atmosphere blocking member 60 is also further arranged above the substrate W, the inconvenience that the rebound phenomenon of the drug solution from the inclined part 31a adheres to the substrate W cannot get up easily, either. Therefore, the reattachment of the drug solution to the substrate W can be controlled suitably.

[0059]Progress of predetermined chemical washing processing time will suspend supply of the drug solution from the penetrant remover feed zones 7a and 70a. And as shown in drawing 6, the guidance member 30 is located in the 2nd height position H2, and the inclined part 31b of the guidance member 30 is located in height position HW of the substrate W held at the spin chuck 1. The interval between the upper surface of the substrate W and the atmosphere blocking member 60 which were held at the spin chuck 1 is maintained to WB, locating the atmosphere blocking member 60 in downward position LH at this time. In this state, the interval ZL of the perpendicular direction of the up-and-down gas incorporation mouths 32a and 32b is decided so that the center section of the gas incorporation mouth 32b of the upper bed part of the inclined part 31b may be closed by the atmosphere blocking member 60.

[0060]Rinsing treatment which washes out the drug solution which supplied pure water to up-and-down both sides of the substrate W from the penetrant remover feed zones 7a and 70a, and has adhered to the substrate W in this state with pure water is performed. The waste fluid (pure water with which the drug solution was mixed) which is shaken off from the peripheral part of the substrate W which rotates in the case of this rinsing treatment, and disperses around, It is caught by the inclined part 31b, and along with the inclined part 31b and the vertical section 34b, it will be led to the 2nd effluent tub 24b from the opening 35, an effluent will be carried out from the 2nd discharge port 28b, and it will be discarded through the abandonment drain 29.

[0061]Although some waste fluid which dispersed from the substrate W and hit the inclined part 31b serves as mist and it floats, the reattachment of the waste fluid to the substrate W can be suitably controlled by the same operation as the case of chemical washing. While an air curtain is formed of the air current which flows down the circumference of the spin base 3 so that the opening between the upper bed of the diaphragm 22a and the gas incorporation mouth 32a may be plugged up, Some of the air currents flow into the 1st effluent tub 24a along with the inclined part 31a, and it is also controlled that the mist of the drug solution which floats to the 1st effluent tub 24a carries out the reattachment to the substrate W.

[0062]If predetermined rinsing treatment time passes, will suspend supply of the pure water from the penetrant remover feed zones 7a and 70a, and the physical relationship of the spin chuck 1,

the guidance member 30, and the atmosphere blocking member 60 will be maintained with drawing 6. The drying process which shakes off the pure water which continued rotation of the spin chuck 1 and has adhered to the substrate W, and dries the substrate W is performed. The waste fluid (pure water) which is shaken off from the peripheral part of the substrate W which rotates in the case of this drying process, and disperses around, It is caught by the inclined part 31b, and along with the inclined part 31b and the vertical section 34b, it will be led to the 2nd effluent tub 24b from the opening 35, an effluent will be carried out from the 2nd discharge port 28b, and it will be discarded through the abandonment drain 29.

[0063]The reattachment of the drug solution to the substrate W under desiccation and after desiccation or waste fluid is suitably controlled by chemical washing and the same operation as the case of rinsing treatment.

[0064]Progress of predetermined drying process time will suspend rotation of the spin chuck 1. And as shown in drawing 4, while locating the guidance member 30 in the 3rd height position H3, The atmosphere blocking member 60 is located in the upper position HH, the carrier robot which does not illustrate in the state receives the substrate W washing processed from the spin chuck 1, and the washing processing to the one substrate W is ended.

[0065]The atmosphere blocking member 60 may be rotated if needed in the case of the washing processing using a drug solution and pure water, and a gas may be made to supply from the gas supply mouths 12a and 73a.

[0066]this invention person is with the case where it has not arranged using this device with the case where the atmosphere blocking member 60 has been arranged like drawing 5 and drawing 6. As a result of carrying out the simulation of the gaseous flow, when the atmosphere blocking member 60 has been arranged, Compared with the case where it has not arranged, the gas incorporation mouth 32a of the guidance member 30, It flowed from the crevice 80 between 32b and the atmosphere blocking member 60, the rate of flow of the gas (drawing 5, field 300 of drawing 6) which flows through the circumference of the substrate W and the spin base 3 became quick, and it checked that the convection of the gas in the lower part space of the spin chuck 1, etc. were reduced.

[0067]When it was made to operate like the above-mentioned explanation of operation and washing processing was performed to the substrate W, there was no adhesion of a drug solution and waste fluid in the substrate W, and the finishing precision of washing was good.

[0068]Since the effluent course of a drug solution and waste fluid is furthermore separated according to this device, the separation effluent of a drug solution and waste fluid can also be performed good. Since according to this device it constitutes so that the member which is made to go up and down the guidance member 30 to the spin chuck 1 and the receptacle member 21, and carries out rise-and-fall displacement within a device may be made into the minimum, Make it go up and down the spin chuck 1 to the guidance member 30 (cup 104) like a device before, or. While being able to simplify an equipment configuration and being able to attain miniaturization of a device compared with the case where you make it go up and down the member which won popularity with the guidance member 30 like the cup 104, and was provided with the function of the member 21 to the spin chuck 1, the structure of the rising and falling mechanism 45 also becomes easy.

[0069]Although the above-mentioned embodiment showed the device which carries out the separation effluent of two kinds of liquid, if it constitutes as shown in drawing 7, the device which carries out the separation effluent of three kinds of liquid is also realizable. An inclined part for the numerals 31c in drawing 7 to carry out the effluent of the 3rd liquid, the gas incorporation mouth by which 32c was formed in the upper bed part of the inclined part 31c, It is a recovery drain for collecting individually the 3rd effluent tub for the vertical section with which 34c is connected in the lower end part of the inclined part 31c, and 24c to carry out the effluent of the 3rd liquid, and the liquid in which 22 d differs between a diaphragm, and 27a and 27b. Other numerals are the same as that of the above-mentioned embodiment. in addition -- in the composition of drawing 7 -- the path R of each gas incorporation mouths 32a, 32b, and 32c -- abbreviated -- by similarly forming. the crevice between these each gas incorporation mouths 32a, 32b, and 32c and the atmosphere blocking member 60 -- all the gas incorporation mouths

32a, 32b, and 32c -- abbreviated -- similarly it can do -- gaseous inflow conditions -- abbreviated -- it can be made the same and can process. interval ZL2 of the perpendicular direction of the gas incorporation mouths 32b and 32c -- the interval ZL of the perpendicular direction of the gas incorporation mouths 32a and 32b -- abbreviated -- by similarly (ZL\*\*ZL2) forming. When you make it go up and down the guidance member 30 so that each inclined parts 31a-31c may be located in the height position HB of the substrate W held at the spin chuck 1, Even if it is maintaining the height of the atmosphere blocking member 60 to HL (the interval of the upper surface of the substrate W and the atmosphere blocking member 60 which were held at the spin chuck 1 is maintained to WB), the physical relationship of the height direction of each gas incorporation mouths 32a-32c and the atmosphere blocking member 60 -- abbreviated -- it can be made the same and the atmosphere blocking member 60 can be arranged -- gaseous inflow conditions -- abbreviated -- it can be made the same and can process. Therefore, if constituted in this way, it is not necessary to change the height of the atmosphere blocking member 60 into each gas incorporation mouth 32a - every 32c, and attachment-and-detachment control of the atmosphere blocking member 60 will become easy.

[0070]The device which carries out the separation effluent of four or more kinds of liquid by the same composition as drawing 7 is also realizable.

[0071]This invention is applicable also like the device which is not provided with the function which carries out the separation effluent of two or more kinds of liquid. In this case, what is necessary is just to constitute a device, as shown in drawing 8.

[0072]Although the above-mentioned embodiment took and explained the device which performs washing processing to the substrate W to the example, this invention is applicable also like various kinds of substrate processing devices which supply other treating solutions to the substrate W, and perform predetermined processing to the substrate W.

[0073]This invention is applicable not only like the device processed to a semiconductor wafer but the device processed to various kinds of substrates, such as a glass substrate for liquid crystal displays, a glass substrate for photo masks, and a substrate for optical discs.

[0074]

[Effect of the Invention]Since it constituted according to the invention according to claim 1 so that the center portion of the gas incorporation mouth of a guidance member might be plugged up, and a treating solution might be supplied to a substrate where an atmosphere shielding member is arranged, and predetermined processing might be performed so that clearly from the above explanation, The rate of flow of the gas incorporated from the slit between a gas incorporation mouth and an atmosphere blocking member can be made comparatively quick, it can control that the mist of a treating solution, etc. carry out the reattachment to a substrate, and the finishing precision of processing can be raised. Since it constituted so that the inclined part to which a path becomes small, so that it goes up might be located in the height position of the substrate held at the substrate holding means and it might process to a substrate, the rebound phenomenon of the treating solution from an inclined part to a substrate can also be controlled. Therefore, the reattachment of the treating solution to a substrate can be reduced and the finishing precision of processing can be raised.

[0075]According to the invention according to claim 2, since the receptacle member provided with the exhaust air tub and the effluent tub provided in the circumference was provided, the mist of a treating solution can be stopped to an effluent tub, and it can control more certainly that the mist of a treating solution, etc. carry out the reattachment to a substrate.

[0076]Since it constitutes so that the member which makes it go up and down a guidance member to a substrate holding means and a receptacle member, and carries out rise-and-fall displacement of the ascending and descending means within a device may be made into the minimum, While being able to simplify an equipment configuration and being able to attain miniaturization of a device compared with making it go up and down a substrate holding means to a guidance member, or making it go up and down the member which won popularity with the guidance member and was provided with the function of a member to a substrate holding means, structure of an ascending and descending means can also be simplified.

[0077]According to the invention according to claim 3, a guidance member, While two or more

inclined parts corresponding to the treating solution of several kinds which opened the interval mutually and were arranged concentrically are formed, A discharge port is provided under the effluent guide flow path formed in the lower part of the innermost inclined part, and the crevice between each inclined part, respectively, and the path of the gas incorporation mouth of the upper bed part of each inclined part -- abbreviated -- it being formed similarly and a rise-and-fall control means, Since it constituted so that the inclined part of the guidance member corresponding to the kind of treating solution supplied to the substrate might be located in the height position of the substrate held at the substrate holding means, and an ascending and descending means might be controlled, It becomes possible to carry out the separation effluent of two or more kinds of treating solutions, and the reattachment of the treating solution to a substrate can be suitably controlled in the device in which the separation effluent of two or more kinds of treating solutions is possible such.

[0078]the path of the gas incorporation mouth of the upper bed part of each inclined part of a guidance member -- abbreviated -- since it is similarly formed -- the crevice between each gas incorporation mouth of a guidance member, and an atmosphere blocking member -- all the gas incorporation mouths -- abbreviated -- similarly it can do, and gaseous inflow conditions can be made the same and can be processed.

[0079]The effluent of the treating solution of several kinds can be carried out in a separate inclined part, an effluent guide flow path, and a discharge port, each liquid is mixed, and since an effluent is not carried out, the separation effluent of each liquid can also be performed suitably.

[0080]Since the receptacle member provided with an exhaust air tub and two or more effluent tubs corresponding to the treating solution of several kinds which were concentrically provided in the circumference was provided according to the invention according to claim 4, In the device in which the separation effluent of two or more kinds of treating solutions is possible, it can control more certainly that the mist of a treating solution, etc. carry out the reattachment to a substrate.

[0081]Since the ascending and descending means was constituted so that you might make it go up and down a guidance member to a substrate holding means and a receptacle member, while being able to attain miniaturization of a device, structure of an ascending and descending means can also be simplified.

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[Translation done.]



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1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1]It is drawing of longitudinal section showing the composition of the substrate processing device concerning one embodiment of this invention.

[Drawing 2]It is a front view showing the composition of an example of a rising and falling mechanism which makes it go up and down a guidance member.

[Drawing 3]It is a block diagram showing the composition of the control system of the device concerning an embodiment.

[Drawing 4]It is a figure for explaining operation of the device concerning an embodiment, and is drawing of longitudinal section showing the state of delivering the substrate to a spin chuck.

[Drawing 5]It is a figure for explaining operation of the device concerning an embodiment, and is drawing of longitudinal section showing the state of chemical washing processing.

[Drawing 6]It is a figure for explaining operation of the device concerning an embodiment, and is drawing of longitudinal section showing the state of rinsing treatment and a drying process.

[Drawing 7]It is drawing of longitudinal section showing the important section composition of the modification for carrying out the separation effluent of three kinds of liquid.

[Drawing 8]It is drawing of longitudinal section showing the important section composition of the modification which is not provided with the function to perform the separation effluent of liquid.

[Drawing 9]It is drawing of longitudinal section showing the composition of a device conventionally.

[Description of Notations]

1: Spin chuck

6: Electrical motor

21: Receptacle member

23: Exhaust air tub

24a, 24b: Effluent tub

26: Exhaust port

28a, 28b: Discharge port

30: Guidance member

31a, 31b: Inclined part

32a, 32b: Gas incorporation mouth

45: Rising and falling mechanism

50: Control section

60: Atmosphere blocking member

67: Attachment-and-detachment mechanism

70a: Penetrant remover feed zone

W: Substrate

HW: The height position of the substrate held at the spin chuck

WB: The interval of the substrate upper surface at the time of substrate treatment, and an atmosphere blocking member

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[Translation done.]

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(71) 出願人 000207551

大日本スクリーン製造株式会社

京都府京都市上京区堀川通寺之内上る4丁

目天神北町1番地の1

(72) 発明者 足立 秀喜

京都府京都市伏見区羽東師古川町322 大

日本スクリーン製造株式会社洛西事業所内

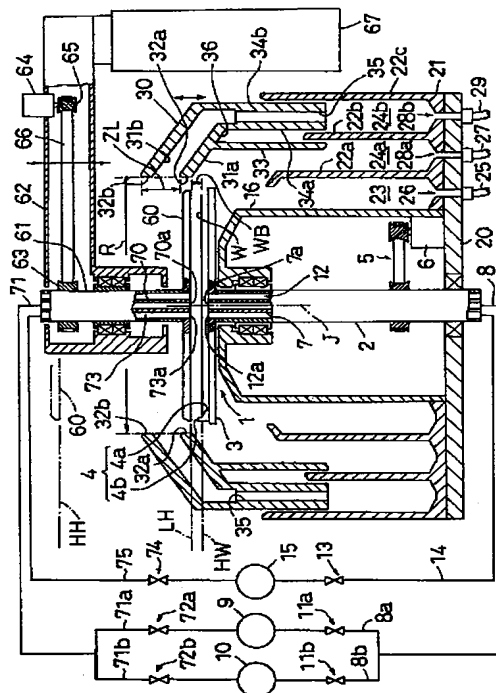
(74) 代理人 弁理士 杉谷 勉

(54) 【発明の名称】 基板処理装置

(57) 【要約】

【課題】 基板への処理液の再付着を抑制し処理の仕上がり精度を向上させる。

【解決手段】 スピンチャック1に保持された基板Wを取り囲むように案内部材30が昇降自在に配置されている。案内部材30には上方に向かうほど径が小さくなる傾斜部31a、31bがその内壁面に形成され、その傾斜部31a、31bの上端部に気体取り込み口32a、32bが形成されている。スピンチャック1の上方には雰囲気気遮断部材60がスピンチャック1に対して接離自在に配置されている。基板Wへの処理は、スピンチャック1に保持された基板Wの高さ位置HWに案内部材30の傾斜部31a(31b)を位置させ、スピンチャック1に保持された基板Wの上面と雰囲気気遮断部材60との間の間隔をWBにして、気体取り込み口32a(32b)の中央部分を雰囲気気遮断部材60で塞いで行う。



## 【特許請求の範囲】

【請求項 1】 基板を水平姿勢で保持する基板保持手段と、  
前記基板保持手段に保持された基板を鉛直方向の軸芯周りで回転させる基板回転手段と、  
前記基板保持手段に保持された基板を取り囲むように設けられ、前記基板回転手段によって回転される基板から飛散する処理液を受け止めて下方の排液口に案内する内壁面を有し、上方に向かうほど径が小さくなる傾斜部が前記内壁面に形成されているとともに、その傾斜部の上端部に気体を取り込む気体取り込み口が形成されている案内部材と、  
前記基板保持手段の下方に設けられ、前記気体取り込み口により取り込まれた気体を排気する排気口と、  
前記基板保持手段の上方に配置され、前記案内部材の気体取り込み口よりも小さい径を有し、前記基板保持手段に保持された基板の上面に対向する対向面から前記基板上面の回転中心付近に処理液を供給する処理液供給部を備えた雰囲気遮断部材と、  
前記基板保持手段と前記案内部材とを相対的に昇降させる昇降手段と、  
前記雰囲気遮断部材を前記基板保持手段に対して相対的に接離させる接離手段と、  
処理液により基板を処理する際、前記基板保持手段に保持された基板の高さ位置に前記案内部材の傾斜部が位置するように前記昇降手段を制御する昇降制御手段と、  
処理液により基板を処理する際、前記基板保持手段に保持された基板の上面と所定間隔隔てて前記雰囲気遮断部材を配置させるように前記接離手段を制御する接離制御手段と、  
を備えたことを特徴とする基板処理装置。

【請求項 2】 請求項 1 に記載の基板処理装置において、  
底部に前記排気口を設けた排気槽と、前記排気槽の周囲に設けられ、底部に前記排液口を設けた排液槽とを備えた受け部材を前記基板保持手段の下方に配設し、  
前記昇降手段は、前記基板保持手段及び前記受け部材に対して前記案内部材を昇降させることを特徴とする基板処理装置。

【請求項 3】 請求項 1 に記載の基板処理装置において、  
前記雰囲気遮断部材に備えられた処理液供給部は、複数種類の処理液を選択的に供給可能に構成され、  
前記案内部材は、互いに間隔をあけて同芯状に配備された各種の処理液に対応した複数の傾斜部が形成されているとともに、最も内側の傾斜部の下方と、各傾斜部の間の隙間に形成される排液案内流路の下方とにそれぞれ排液口が設けられ、かつ、各傾斜部の上端部の気体取り込み口の径が略同じに形成され、  
前記昇降制御手段は、前記基板保持手段に保持された基

板の高さ位置に、その基板に供給する処理液の種類に対応した前記案内部材の傾斜部が位置するように前記昇降手段を制御することを特徴とする基板処理装置。

【請求項 4】 請求項 3 に記載の基板処理装置において、  
底部に前記排気口を設けた排気槽と、前記排気槽の周囲に同芯状に設けられ、底部にそれぞれ排液口を設けた各種の処理液に対応した複数の排液槽とを備えた受け部材を前記基板保持手段の下方に配設し、  
前記昇降手段は、前記基板保持手段及び前記受け部材に対して前記案内部材を昇降させるように構成したことを特徴とする基板処理装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、半導体ウエハや液晶表示器用のガラス基板、フォトマスク用のガラス基板、光ディスク用の基板などの基板を水平姿勢に保持した状態で鉛直方向の軸芯周りで回転させながら、洗浄液などの処理液を基板に供給して、洗浄処理などの所定の処理を基板に施す基板処理装置に関する。

## 【0002】

【従来の技術】従来のこの種の基板処理装置の一例を図 9 に示す。図 9 に示す装置は、基板に薬液や純水を用いた洗浄処理を施すための装置であり、薬液と廃液とを分離して排液する機能を備えている。

【0003】この装置は、基板 W を水平姿勢で吸着保持した状態で、鉛直方向の軸芯周りで回転可能なスピンドル 100 と、回転軸 101 を介してスピンドル 100 を高速回転させるためのモーター 102 と、スピンドル 100 を昇降させる昇降機構 103 と、処理する基板 W を包囲して処理室 104 a を形成するカップ 104 と、基板 W に対して斜め上方または斜め下方から薬液や純水などの洗浄液を供給するための洗浄液ノズル 105 a、105 b、105 c、105 d とを備えている。

【0004】カップ 104 の底部には、基板 W の洗浄のために使用された後の洗浄液を排液する排液口 106 が形成されている。このカップ 104 の内壁面は、処理中に、回転される基板 W から飛散される洗浄液を受け止めて排液口 106 に案内する。また、カップ 104 の上端部には、気体を取り込む気体取り込み口 107 が形成されている。この種の基板処理装置はクリーンルーム内に設置されるが、クリーンルーム内には、天井から床面へ向けてダウンフローで清浄気体が流下されている。このダウンフローの清浄気体を気体取り込み口 107 からカップ 104 内の処理室 104 a に取り込み、カップ 104 に設けられた排気口 108 から排気して、処理室 104 a 内に浮遊する洗浄液のミストなどを排出するように構成されている。

【0005】また、カップ 104 の下方には排液口 10

6に対向するリング状の樋溝109を有する略円盤状の樋部材110が、回転軸101を包囲する保護筒111に回転自在に取り付けられている。樋溝109の底部の所定の箇所には、排液流下口112が形成されている。また、樋部材110の外周にはリングギア113が固定されており、このリングギア113には、モーター114の駆動軸に取り付けられた駆動ギア115が歯合している。樋部材110のさらに下方には、洗浄処理に使用された後の廃液を廃棄するための廃棄ドレイン116と、薬液を回収するための回収ドレイン117とが設けられている。このような構成により、モーター114を駆動することによって、樋部材109の排液流下口112を廃棄ドレイン116または回収ドレイン117のいずれかの上方に選択的に位置させることができる。

【0006】この従来装置は以下のように動作する。まず、スピンチャック100が上昇され、カップ104の上方から突出された状態で、図示しない搬送ロボットから未処理の基板Wがスピンチャック100に受け渡される。基板Wを受け取ったスピンチャック100は昇降機構103によって下降され、基板Wが処理室104a内に位置される。そして、スピンチャック100とともに基板Wが回転され、その基板Wに洗浄液ノズル105a～105dから薬液が供給され、薬液による洗浄処理が基板Wに施される。この薬液洗浄処理の際には、排液流下口112を回収ドレイン117の上方に位置させることによって、再利用のために薬液を回収することができる。所定の薬液洗浄処理時間が経過すると、洗浄液ノズル105a～105dから基板Wに対して供給する洗浄液を薬液から純水に切り換えて、基板Wに付着している薬液を純水で洗い落とすリンス処理が基板Wに施される。このリンス処理の際には、排液流下口112を廃棄ドレイン116の上方に位置させることによって、洗浄処理に使用された後の廃液（薬液が混ざった純水）を廃棄することができる。所定のリンス処理時間が経過すると、洗浄液ノズル105a～105dからの純水の供給を停止し、基板Wをそのまま回転させて基板Wに付着している純水を振り切り乾燥させる。基板Wの乾燥を終えると、スピンチャック100の回転が停止される。そして、スピンチャック100が昇降機構103によって上昇され、カップ104の上方から突出された状態で、図示しない搬送ロボットが洗浄処理済の基板Wをスピンチャック100から受け取り、1枚の基板Wに対する洗浄処理が終了する。

【0007】

【発明が解決しようとする課題】しかしながら、従来装置で洗浄した洗浄後の基板Wは汚染されていることがあり、従来装置は洗浄の仕上がり精度に問題があった。本発明者は、この不都合を調査したところ、以下の原因によることを突き止めた。

【0008】すなわち、本発明者は従来装置の処理室1

04a内の気体の流れをシュミレーションで解析したところ、スピンチャック100の下方領域200で気流の対流が起きていたことが判明した。一方、処理中に、回転される基板Wから飛散される洗浄液は、カップ104の内壁面に当たり、その一部が霧状のミストとなって、処理室104a内で浮遊する。この洗浄液のミストは、本来、排気口108から排気されるべきものであるが、スピンチャック100の下方領域200での気流の対流によって基板W側に逆流され、基板Wの乾燥中、あるいは、その終了後に基板Wに洗浄液のミストが再付着し、洗浄後の基板Wを汚染していたものと考えられる。

【0009】本発明者は、さらにスピンチャック100の下方領域200で気流が対流する原因を調査したところ、スピンチャック100に保持された基板Wとカップ104の内壁面との間の間隔が広いために、その開口部分から処理室104a内に流入する気体の流速が遅くなり、そのために、処理室104a内の気流の一部が、排気口108から排気されずにスピンチャック100の下方領域200に流れ、そこに気流の対流を生じさせていたことが、シュミレーションによって明らかになった。

【0010】そこで、例えば、カップ104の内壁面をスピンチャック100に保持された基板Wに近づけるようにカップ104を設計すれば、スピンチャック100の下方領域200での気流の対流を無くすることができると考えられる。しかしながら、回転される基板Wから飛散した洗浄液はカップ104の内壁面に当たったときにその一部が基板W側に跳ね返ってくるが、カップ104の内壁面をスピンチャック100に保持された基板Wに近づければ、カップ104の内壁面から跳ね返ってきた洗浄液が基板Wに再付着し易くなり、却って基板Wを汚染することになる。

【0011】また、基板を回転させながら基板に所定の処理液を供給して基板に所定の処理を施す場合に、基板に処理液が再付着することで処理の仕上がり精度が悪くなることは一般的に知られている。従って、洗浄処理に限らず、その他の基板処理においても、カップなどを含む装置構成上、上記従来装置と同様の理由で、処理液が基板に再付着する問題が生じ得る。

【0012】また、従来装置は薬液と廃液とを分離して排液する機能を備えているが、従来装置の構成では、カップ104から排液口106を経て樋部材110の排液流下口112に至る経路を、回収対象の薬液と廃棄対象の廃液とで共通して使用しており、そのため、この経路での2液の混合を避けることができず、薬液と廃液との分離排液が不十分であった。

【0013】本発明は、このような事情に鑑みてなされたものであって、基板への処理液の再付着を抑制し、基板処理の仕上がり精度を向上させることができる基板処理装置を提供することを主目的とする。

【0014】また、本発明の別の目的は、処理に使用し

た複数種類の処理液を分離廃液する機能を備えた装置において、上記主目的を好適に達成することにある。

【0015】また、本発明のさらに別の目的は、処理に使用した複数種類の処理液を分離廃液する機能を備えた装置において、上記主目的を好適に達成するとともに、処理に使用した複数種類の処理液の分離廃液をも好適に行える装置を提供することにある。

【0016】

【課題を解決するための手段】本発明は、このような目的を達成するために、次のような構成をとる。すなわち、請求項1に記載の発明は、基板を水平姿勢で保持する基板保持手段と、前記基板保持手段に保持された基板を鉛直方向の軸芯周りで回転させる基板回転手段と、前記基板保持手段に保持された基板を取り囲むように設けられ、前記基板回転手段によって回転される基板から飛散する処理液を受け止めて下方の排液口に案内する内壁面を有し、上方に向かうほど径が小さくなる傾斜部が前記内壁面に形成されているとともに、その傾斜部の上端部に気体を取り込む気体取り込み口が形成されている案内部材と、前記基板保持手段の下方に設けられ、前記気体取り込み口により取り込まれた気体を排気する排気口と、前記基板保持手段の上方に配置され、前記案内部材の気体取り込み口よりも小さい径を有し、前記基板保持手段に保持された基板の上面に対向する対向面から前記基板上面の回転中心付近に処理液を供給する処理液供給部を備えた雰囲気遮断部材と、前記基板保持手段と前記案内部材とを相対的に昇降させる昇降手段と、前記雰囲気遮断部材を前記基板保持手段に対して相対的に接離させる接離手段と、処理液により基板を処理する際、前記基板保持手段に保持された基板の高さ位置に前記案内部材の傾斜部が位置するように前記昇降手段を制御する昇降制御手段と、処理液により基板を処理する際、前記基板保持手段に保持された基板の上面と所定間隔隔てて前記雰囲気遮断部材を配置させるように前記接離手段を制御する接離制御手段と、を備えたことを特徴とするものである。

【0017】請求項2に記載の発明は、上記請求項1に記載の基板処理装置において、底部に前記排気口を設けた排気槽と、前記排気槽の周囲に設けられ、底部に前記排液口を設けた排液槽とを備えた受け部材を前記基板保持手段の下方に配設し、前記昇降手段は、前記基板保持手段及び前記受け部材に対して前記案内部材を昇降させることを特徴とするものである。

【0018】請求項3に記載の発明は、上記請求項1に記載の基板処理装置において、前記雰囲気遮断部材に備えられた処理液供給部は、複数種類の処理液を選択的に供給可能に構成され、前記案内部材は、互いに間隔をあけて同芯状に配備された各種の処理液に対応した複数の傾斜部が形成されているとともに、最も内側の傾斜部の下方と、各傾斜部の間の隙間に形成される排液案内流

路の下方とにそれぞれ排液口が設けられ、かつ、各傾斜部の上端部の気体取り込み口の径が略同じに形成され、前記昇降制御手段は、前記基板保持手段に保持された基板の高さ位置に、その基板に供給する処理液の種類に対応した前記案内部材の傾斜部が位置するように前記昇降手段を制御することを特徴とするものである。

【0019】請求項4に記載の発明は、上記請求項3に記載の基板処理装置において、底部に前記排気口を設けた排気槽と、前記排気槽の周囲に同芯状に設けられ、底部にそれぞれ排液口を設けた各種の処理液に対応した複数の排液槽とを備えた受け部材を前記基板保持手段の下方に配設し、前記昇降手段は、前記基板保持手段及び前記受け部材に対して前記案内部材を昇降させるように構成したことを特徴とするものである。

【0020】

【作用】請求項1に記載の発明の作用は次のとおりである。基板保持手段に基板が保持されると、昇降制御手段は、基板保持手段に保持された基板の高さ位置に案内部材の傾斜部が位置するように、基板保持手段と案内部材とを相対的に昇降させる昇降手段を制御する。一方で、接離制御手段は、基板保持手段に保持された基板の上面と所定間隔隔てて雰囲気遮断部材を配置させるように、雰囲気遮断部材を基板保持手段に対して相対的に接離させる接離手段を制御する。

【0021】そして、基板回転手段により、基板保持手段に保持された基板が鉛直方向の軸芯周りで回転されながら、雰囲気遮断部材に備えられた処理液供給部から基板上面の回転中心付近に処理液が供給されて基板に対して所定の処理が施される。

【0022】このとき、回転される基板から飛散した処理液の大部分は、案内部材の傾斜部で受け止められ、傾斜部に沿って下方の排液口に案内される。また、傾斜部の一部に当たった処理液の一部は霧状のミストとなつて、案内部材の内壁面の内側の空間に浮遊することになる。

【0023】しかしながら、基板の上面から所定間隔隔てて配置された雰囲気遮断部材により、案内部材の気体取り込み口の中央部分が塞がれることになる。従って、案内部材の内壁面の内側の空間には、案内部材の気体取り込み口と雰囲気遮断部材との間の狭い隙間から気体が流入することになり、その隙間から流入し、基板の周囲を流下して基板保持手段の下方に設けられた排気口に流れる気体の流速は比較的速くなり、基板保持手段の下方空間で気体の対流が起き難くなる。また、基板の周囲を流下する気流がエアーカーテンの役目を果たすことになるので、そのエアーカーテンの外部に浮遊する処理液のミストがそのエアーカーテンの内部の基板側に流れるのを抑制することもできる。さらに、処理液のミストの基板への再付着が抑制できるので、案内部材の傾斜部を必要以上に基板保持手段に保持された基板に近づけるよう

に装置を設計する必要もない。また、回転される基板から飛散した処理液は、上方に向かうほど径が小さくなる傾斜部で受け止められるので、処理液の大部分は下方に向かって跳ね返ることになり、基板側への処理液の跳ね返りを少なくできる。従って、基板への処理液の再付着を好適に抑制することができる。

【0024】請求項2に記載の発明によれば、案内部材の気体取り込み口と雰囲気遮断部材との間の隙間から流入した気体は、基板の周囲を流下し、基板保持手段の下方に配設された受け部材を構成する排気槽を経て、その排気槽の底部に設けられた排気口から排気される。一方、回転される基板から飛散した処理液は、案内部材の傾斜部に沿って排気槽の周囲に設けられた排液槽を経て、その排液槽の底部に設けられた排液口から排液される。また、案内部材の傾斜部に当たって発生した処理液のミストは排液槽内に浮遊するので、そのミストの基板への再付着が一層起き難くなる。

【0025】また、昇降手段は、基板保持手段及び受け部材に対して案内部材を昇降させるように構成されていて、昇降制御手段による制御では、基板保持手段及び受け部材に対して案内部材を昇降させて、基板保持手段に保持された基板の高さ位置に案内部材の傾斜部が位置するように基板保持手段に対する案内部材の高さが制御される。

【0026】請求項3に記載の発明によれば、昇降制御手段により、基板保持手段に保持された基板の高さ位置に、その基板にこれから供給する処理液の種類に対応した案内部材の傾斜部が位置するように昇降手段が制御される。そして、雰囲気遮断部材に備えられた処理液供給部から、その傾斜部に対応する処理液が基板に供給されて基板に処理が施される。基板に供給された処理液は、その処理液に対応する案内部材の傾斜部に沿ってその下方の個別の排液口から排液される。

【0027】基板に別の種類の処理液を供給して処理するときには、昇降制御手段により、基板保持手段に保持された基板の高さ位置に、その別の種類の処理液に対応した案内部材の傾斜部が位置するように昇降手段が制御され、雰囲気遮断部材に備えられた処理液供給部から、その別の種類の処理液が基板に供給されて基板に処理が施される。この別の種類の処理液は、その処理液に対応する案内部材の傾斜部に沿ってその下方の個別の排液口から排液される。

【0028】従って、処理に使用した複数種類の処理液を分離して排液することができる。そして、各種の処理液による処理の際に、基板保持手段に保持された上方には雰囲気遮断部材が配置されているので、請求項1に記載の発明と同様の作用により、基板への各種の処理液の再付着を好適に抑制することができる。

【0029】また、各傾斜部の上端部の気体取り込み口の径が略同じに形成されているので、案内部材の各気体

取り込み口と雰囲気遮断部材との間の隙間を、全ての気体取り込み口で略同じにでき、気体の流入条件を同じにして処理することもできる。

【0030】さらに、各種の処理液を別々の傾斜部、排液案内流路、排液口で排液するので、各液が混ざって排液されることがなく、各液の分離排液も好適に行える。

【0031】請求項4に記載の発明によれば、受け部材には、底部にそれぞれ排液口を設けた各種の処理液に対応した複数の排液槽が排気槽の周囲に同芯状に設けられていて、回転される基板から飛散した処理液は、その処理液に対応する案内部材の傾斜部に沿って、その処理液に対応する排液槽を経て、その排液槽の底部に設けられた排液口から排液される。

【0032】また、昇降手段は、請求項2に記載の発明と同様に、基板保持手段及び受け部材に対して案内部材を昇降させるように構成されていて、昇降制御手段による制御では、基板保持手段及び受け部材に対して案内部材を昇降させて、基板保持手段に保持された基板の高さ位置に、基板に供給する処理液の種類に対応した案内部材の傾斜部が位置するように昇降手段が制御される。

【0033】

【発明の実施の形態】以下、図面を参照して本発明の実施の形態を説明する。図1は本発明の一実施形態に係る基板処理装置の構成を示す縦断面図である。この装置は、処理対象の半導体ウエハ（基板）Wに薬液や純水を用いた洗浄処理を施すためのものであり、薬液と廃液とを分離して排液する機能を備えている。

【0034】基板Wは、基板保持手段としてのスピンドル1に水平姿勢で保持される。このスピンドル1は、回転軸2の上端に一体回転可能に取り付けられたスピンドルベース3を有している。スピンドルベース3の上面には、基板Wの外周部を3箇所以上で保持する3個以上の基板保持部材4が、スピンドルベース3の周縁に沿って等間隔で立設されている。なお、図1以下では、図面が煩雑になることを避けるために、1個の基板保持部材4のみを示している。

【0035】各基板保持部材4は、基板Wの外周部を下方から支持する基板支持部4aと基板支持部4aに支持された基板Wの外周端面を押圧して基板Wを保持する基板保持部4bとを備えている。各基板保持部材4は、基板保持部4bが基板Wの外周端面を押圧する保持状態と、基板保持部4bが基板Wの外周端面から離れる非保持状態とで切換え可能に構成されている。この保持状態と非保持状態との切り換えは、例えば、特公平3-9607号公報に開示されたリンク機構などによって実現されている。

【0036】回転軸2の下端付近には、ベルト伝動機構5などによって基板回転手段としての電動モーター6が連動連結されていて、電動モーター6を駆動することに

よって、回転軸2、スピンチャック1とともに、スピンチャック1に保持された基板Wを鉛直方向の軸芯J周りで回転させる。

【0037】また、回転軸2は中空を有する筒状の部材で構成され、この中空部に洗浄液供給管7が貫通され、その上端部の洗浄液供給部7aからスピンチャック1に保持された基板Wの下面の回転中心付近に洗浄液を供給できるように構成されている。洗浄液供給管7は配管8に連通接続されている。この配管8の基端部は分岐されていて、一方の分岐配管8aには薬液供給源9が連通接続され、他方の分岐配管8bには純水供給源10が連通接続されている。各分岐配管8a、8bには開閉バルブ11a、11bが設けられていて、これら開閉バルブ11a、11bの開閉を切り換えることで、洗浄液供給部7aから薬液と純水とを選択的に切り換えて供給できるようになっている。

【0038】また、回転軸2の中空部の内壁面と洗浄液供給管7の外壁面との間の隙間は、気体供給路12となっている。この気体供給路12は、開閉バルブ13が設けられた配管14を介して気体供給源15に連通接続されていて、気体供給路12の上端部の気体供給部12aからスピンベース3と基板Wの下面との間の空間に、清浄な空気や清浄な不活性ガス（窒素ガスなど）などの清浄な気体を供給できるように構成されている。

【0039】回転軸2やベルト伝動機構5、電動モーター6などは、ベース部材20上に設けられた円筒状のケーシング16内に収容されている。

【0040】ベース部材20上のケーシング16の周囲には受け部材21が固定的に取り付けられている。受け部材21には、円筒状の仕切り部材22a、22b、22cが立設されていて、これら仕切り部材22a～22cとケーシング16の外壁面とによって、排気槽23、第1の排液槽24a、第2の排液槽24bが形成されている。ケーシング16の外壁面と内側の仕切り部材22aの内壁面との間の空間が排気槽23であり、内側の仕切り部材22aの外壁面と中間の仕切り部材22bの内壁面との間の空間が第1の排液槽24aであり、中間の仕切り部材22bの外壁面と外側の仕切り部材22cの内壁面との間の空間が第2の排液槽24bである。

【0041】排気槽23の底部には排気ダクト25に連通接続された排気口26が設けられていて、排気口26から排気槽23内の気体が吸引されるように構成されている。また、第1の排液槽24aの底部には回収ドレイン27に連通接続された第1の排液口28aが設けられ、第2の排液槽24bの底部には廃棄ドレイン29に連通接続された第2の排液口28bが設けられている。

【0042】なお、図1以下では、図面が煩雑になることを避けるために、各仕切り部材22a～22c、及び、後述する案内部材30は、断面形状のみを示している。

【0043】第1、第2の排液槽24a、24bの上方には、スピンチャック1及びそれによって保持された基板Wの周囲を包囲するように筒状の案内部材30が昇降自在に設けられている。この案内部材30には、上方に向かうほど径が小さくなる傾斜部31a、31bが2箇所形成されている。各傾斜部31a、31bは、互いに間隔をあけて同芯状に配備されている。また、各傾斜部31a、31bの上端部には径Rが同じに構成された気体取り込み口32a、32bが形成されている。さらに、傾斜部31aの下端部には垂直部33、34aが連なっており、傾斜部31bの下端部には垂直部34bが連なっている。各傾斜部31a、31bは、垂直部34a、34bを介して連結されており、この連結部分には円周方向に、排液案内流路を形成する多数の開口35が穿設されている。また、案内部材30には、垂直部33と垂直部34aの間に円環状の溝36が形成されていて、この溝36が中間の仕切り部材22bに嵌入されるとともに、垂直部34a、34bが、第2の廃液槽24b内に嵌入されるように、案内部材30が配置されている。

【0044】スピンチャック1に保持された基板Wの高さ位置HWに、傾斜部31aが位置しているとき、回転される基板Wから飛散される洗浄液は傾斜部31aで受け止められ、傾斜部31a、垂直部33に沿って第1の排液槽24aに導かれ、第1の排液口28aから排液されることになる。この装置では、傾斜部31a、垂直部33、第1の排液槽24a、第1の排液口28aは薬液の回収に用いられ、第1の排液口28aから回収ドレイン27を経て図示しない回収タンクへ薬液が回収され、その回収タンクから回収された薬液が薬液供給源9に供給されて、薬液が再利用されるようになっている。

【0045】また、スピンチャック1に保持された基板Wの高さ位置HWに、傾斜部31bが位置しているとき、回転される基板Wから飛散される洗浄液は傾斜部31bで受け止められ、傾斜部31b、垂直部34bに沿って、開口35から第2の排液槽24bに導かれ、第2の排液口28bから排液されることになる。この装置では、傾斜部31b、垂直部34b、開口35、第2の排液槽24b、第2の排液口28bは洗浄処理に使用された後の廃液（薬液が混ざった純水）の廃棄に用いられ、第2の排液口28bから廃棄ドレイン29を経て廃液が廃棄されるようになっている。

【0046】案内部材30を昇降させる昇降機構の一例の構成を図2を参照して説明する。案内部材30は、支持部材40を介して昇降部材41に支持されている。この昇降部材41には、螺軸42が螺合されているとともに、ガイドレール43に摺動自在に嵌め込まれている。螺軸42に連結されたモーター44を駆動することにより昇降部材41が昇降され、これに伴って案内部材30が昇降されるようになっている。昇降部材41、螺軸4



2、ガイドレール43、モーター44などが昇降手段に相当する昇降機構45を構成する。

【0047】案内部材30は、スピンチャック1に保持された基板Wの高さ位置HWに傾斜部31aが位置する第1の高さH1、基板Wの高さ位置HWに傾斜部31bが位置する第2の高さH2、上方の気体取り込み口32bが基板Wの高さ位置HWよりも下方に位置する第3の高さ位置H3の3段階の高さ位置で昇降される。案内部材30の上記第1～第3の高さ位置H1～H3に対応する昇降部材41の高さ位置には、反射型の光センサなどで構成される昇降部材41検出用のセンサ46a～46cが配設され、これらセンサ46a～46cからの検出信号に基づき、モーター44が駆動制御され案内部材30が第1～第3の高さ位置H1～H3に位置させるように構成されている。なお、図3に示すように、この昇降制御は、昇降制御手段、接離制御手段として機能する制御部50によって行われるように構成されている。

【0048】図1に戻って、スピンチャック1の上方には中心部に開口を有する雰囲気遮断部材60が配置されている。この雰囲気遮断部材60は、基板Wの径より若干大きく、かつ、案内部材30の気体取り込み口32a、32bの径Rよりも小さい径を有して、中空を有する筒状の支持軸61の下端部に一体回転可能に取り付けられている。支持軸61は、支持アーム62に回転自在に支持されている。支持軸61には従動プーリ63が一体回転可能に取り付けられている。その従動プーリ63と、モーター64の駆動軸に連結された主動プーリ65との間に無端ベルト66が架け渡されていて、モーター64を駆動することにより支持軸61とともに雰囲気遮断部材60が鉛直方向の軸芯J周りに回転されるように構成されている。

【0049】また、支持アーム62は、接離手段に相当する接離機構67によって昇降され、この支持アーム62の昇降によって、スピンチャック1に対して雰囲気遮断部材60が接離されるように構成されている。この装置では、雰囲気遮断部材60がスピンチャック1に保持された基板Wの上面に対して所定の間隔WB隔てた下方位置LHと、雰囲気遮断部材60がスピンチャック1に保持された基板Wの上面から上方に大きく離れた上方位置HHとの2段階の位置との間で雰囲気遮断部材60が昇降できるように構成されている。このような接離動を実現する接離機構67は、昇降機構45と同様に螺軸などを有した機構や、あるいは、エアシリンダなどで構成されている。図3に示すように、この接離制御も制御部50によって行われるように構成されている。

【0050】図1に戻って、雰囲気遮断部材60の中心の開口及び支持軸61の中空部には、洗浄液供給管70が貫通され、その下端部の洗浄液供給部70aからスピンチャック1に保持された基板Wの上面の回転中心付近に洗浄液を供給できるように構成されている。洗浄液供

給管70は配管71に連通接続されている。この配管71の基端部は分岐されていて、一方の分岐配管71aには薬液供給源9が連通接続され、他方の分岐配管71bには純水供給源10が連通接続されている。各分岐配管71a、71bには開閉バルブ72a、72bが設けられていて、これら開閉バルブ72a、72bの開閉を切り換えることで、洗浄液供給部70aから薬液と純水とを選択的に切り換えて供給できるようになっている。

【0051】また、雰囲気遮断部材60の中心の開口の内壁面及び支持軸61の中空部の内壁面と、洗浄液供給管70の外壁面との間の隙間は、気体供給路73となっている。この気体供給路73は、開閉バルブ74が設けられた配管75を介して気体供給源15に連通接続されていて、気体供給路73の下端部の気体供給部73aから雰囲気遮断部材60と基板Wの上面との間の空間に清浄な気体を供給できるように構成されている。

【0052】制御部50は、案内部材30の昇降制御と雰囲気遮断部材60の接離制御の他にも、スピンチャック1の回転制御や雰囲気遮断部材60の回転制御、洗浄液供給部7a、70aからの洗浄液の供給制御、気体供給部12a、73aからの気体の供給制御などの制御も行うように構成されている。

【0053】以上のような構成を有する装置の動作を図4ないし図6を参照して説明する。図4はスピンチャック1に対する基板Wの受渡しを行う状態を示し、図5は薬液洗浄処理の状態、図6はリンス処理及び乾燥処理の状態を示している。

【0054】まず、図4に示すように、案内部材30を第3の高さ位置H3に位置させて、スピンチャック1を案内部材30の上方から突出させるとともに、雰囲気遮断部材60を上方位置HHに位置させて、雰囲気遮断部材60とスピンチャック1との間の間隔を広げる。この状態で、図示しない搬送ロボットが未処理の基板Wをスピンチャック1に引き渡す。スピンチャック1は受け取った基板Wを保持する。

【0055】基板Wの受け取りが終わると、図5に示すように、案内部材30を第1の高さ位置H1に位置させて、スピンチャック1に保持された基板Wの高さ位置HWに案内部材30の傾斜部31aを位置させるとともに、雰囲気遮断部材60を下方位置LHに位置させて、スピンチャック1に保持された基板Wの上面と雰囲気遮断部材60との間の間隔をWBにする。これにより、傾斜部31aの上端部の気体取り込み口32aの中央部分は雰囲気遮断部材60によって塞がれることになる。上記間隔WBは、雰囲気遮断部材60が気体取り込み口32aの中央部分を塞ぐように配置される間隔である。

【0056】この状態で、スピンチャック1とともに基板Wを回転させ、洗浄液供給部7a、70aから薬液を基板Wの上下両面に供給して薬液洗浄処理を行う。この薬液洗浄処理の際に、回転される基板Wの外周部から振

り切られて周囲に飛散する薬液は、傾斜部 31a で受け止められ、傾斜部 31a、垂直部 33 に沿って第 1 の排液槽 24a に導かれ、第 1 の排液口 28a から排液され、回収ドレイン 27 を経て回収タンクに回収されることになる。

【0057】また、基板 W から飛散され傾斜部 31a に当たった薬液の一部はミストとなって浮遊することになる。しかしながら、この装置では、基板 W の上面から所定間隔 WB 隔てて配置された雰囲気遮断部材 60 により、案内部材 30 の気体取り込み口 32a の中央部分が塞がれているので、案内部材 30 の内壁面の内側の空間には、案内部材 30 の気体取り込み口 32a と雰囲気遮断部材 60 との間の円環状の狭い隙間 80 から気体が入ることになり、その隙間 80 から流入し、基板 W 及びスピンベース 3 の周囲を流下してスピンチャック 1 の下方の排気口 26 に流れる気体の流速は比較的速くなり、スピンチャック 1 の下方空間で気体の対流が起き難くなる。また、基板 W の周囲を流下する気流がエアーカーテンの役目を果たすことになるので、そのエアーカーテンの外部に浮遊する薬液のミストがそのエアーカーテンの内部の基板 W 側に流れるのを抑制することにもなる。さらに、気流の一部が第 1 の排液槽 24a 内にも流れるので、その気流によって傾斜部 31a 付近に浮遊する薬液のミストは第 1 の処理槽 24a 内に押し流される。従って、薬液のミストが基板 W に再付着するのを抑制することができる。

【0058】また、案内部材 30 の傾斜部 31a とスピンチャック 1 に保持された基板 W とは十分に離されるように案内部材 30 が配置されているとともに、案内部材 30 の傾斜部 31a (31b) は、上方に向かうほど径が小さくなるように形成されさらに、基板 W の上方に雰囲気遮断部材 60 も配置されているので、傾斜部 31a からの薬液の跳ね返りが基板 W に付着するような不都合も起き難い。従って、基板 W への薬液の再付着を好適に抑制することができる。

【0059】所定の薬液洗浄処理時間が経過すると、洗浄液供給部 7a、70a からの薬液の供給を停止する。そして、図 6 に示すように、案内部材 30 を第 2 の高さ位置 H2 に位置させて、スピンチャック 1 に保持された基板 W の高さ位置 HW に案内部材 30 の傾斜部 31b を位置させる。このとき、雰囲気遮断部材 60 は下方位置 LH に位置させたまま、すなわち、スピンチャック 1 に保持された基板 W の上面と雰囲気遮断部材 60 との間隔を WB に維持している。この状態で、傾斜部 31b の上端部の気体取り込み口 32b の中央部が雰囲気遮断部材 60 によって塞がれるように、上下の気体取り込み口 32a、32b の鉛直方向の間隔 ZL が決められている。

【0060】この状態で、洗浄液供給部 7a、70a から純水を基板 W の上下両面に供給して基板 W に付着して

いる薬液を純水で洗い落とすリンス処理を行う。このリンス処理の際に、回転される基板 W の外周部から振り切られて周囲に飛散する廃液 (薬液が混ざった純水) は、傾斜部 31b で受け止められ、傾斜部 31b、垂直部 34b に沿い、開口 35 から第 2 の排液槽 24b に導かれ、第 2 の排液口 28b から排液され、廃棄ドレイン 29 を経て廃棄されることになる。

【0061】また、基板 W から飛散され傾斜部 31b に当たった廃液の一部はミストとなって浮遊するが、薬液洗浄の場合と同様の作用により、基板 W への廃液の再付着を好適に抑制することができる。さらに、スピンベース 3 の周囲を流下する気流によって、仕切り部材 22a の上端と気体取り込み口 32a との間の開口を塞ぐようにエアーカーテンが形成されるとともに、その一部の気流が傾斜部 31a に沿って第 1 の排液槽 24a に流入し、第 1 の排液槽 24a に浮遊する薬液のミストが基板 W に再付着することも抑制される。

【0062】所定のリンス処理時間が経過すると、洗浄液供給部 7a、70a からの純水の供給を停止し、スピンチャック 1、案内部材 30、雰囲気遮断部材 60 の位置関係を図 6 のまま維持して、スピンチャック 1 の回転を継続して基板 W に付着している純水を振り切って基板 W を乾燥させる乾燥処理を行う。この乾燥処理の際に、回転される基板 W の外周部から振り切られて周囲に飛散する廃液 (純水) は、傾斜部 31b で受け止められ、傾斜部 31b、垂直部 34b に沿い、開口 35 から第 2 の排液槽 24b に導かれ、第 2 の排液口 28b から排液され、廃棄ドレイン 29 を経て廃棄されることになる。

【0063】また、薬液洗浄、リンス処理の場合と同様の作用により、乾燥中および乾燥後の基板 W への薬液や廃液の再付着が好適に抑制される。

【0064】所定の乾燥処理時間が経過すると、スピンチャック 1 の回転を停止する。そして、図 4 に示すように、案内部材 30 を第 3 の高さ位置 H3 に位置させるとともに、雰囲気遮断部材 60 を上方位置 HH に位置させ、その状態で、図示しない搬送ロボットが洗浄処理済の基板 W をスピンチャック 1 から受け取って、1 枚の基板 W に対する洗浄処理を終了する。

【0065】なお、薬液、純水を用いた洗浄処理の際に、必要に応じて、雰囲気遮断部材 60 を回転させてもよいし、気体供給口 12a、73a から気体を供給させてもよい。

【0066】本発明者は、この装置を用いて、雰囲気遮断部材 60 を図 5、図 6 のように配置した場合と配置しなかった場合とで、気体の流れをシュミレーションした結果、雰囲気遮断部材 60 を配置した場合は、配置しなかった場合に比べて、案内部材 30 の気体取り込み口 32a、32b と雰囲気遮断部材 60 との間の隙間 80 から流入し、基板 W 及びスピンベース 3 の周囲を流れる気体 (図 5、図 6 の領域 300) の流速が速くなり、スピ

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ンチャック 1 の下方空間での気体の対流などが軽減されていることを確認した。

【0067】また、上記動作説明のように動作させて基板 W に洗浄処理を施すと、基板 W に薬液や廃液の付着が無く、洗浄の仕上がり精度が良好であった。

【0068】さらにこの装置によれば、薬液と廃液の排液経路を分離しているので、薬液と廃液の分離排液も良好に行える。また、この装置によれば、スピンチャック 1 及び受け部材 21 に対して案内部材 30 を昇降させ、装置内で昇降変位させる部材を最小限にするように構成しているの、従来装置のように案内部材 30 (カップ 104) に対してスピンチャック 1 を昇降させたり、カップ 104 のように案内部材 30 と受け部材 21 の機能を備えた部材をスピンチャック 1 に対して昇降させる場合に比べて、装置構成が簡略化でき、装置のコンパクト化が図れるとともに、昇降機構 45 の構造も簡単になる。

【0069】なお、上記実施形態では、2 種類の液を分離排液する装置を示したが、図 7 に示すように構成すれば、3 種類の液を分離排液する装置を実現することもできる。図 7 中の符号 31c は第 3 の液を排液するための傾斜部、32c はその傾斜部 31c の上端部に形成された気体取り込み口、34c はその傾斜部 31c の下端部に連なる垂直部、24c は第 3 の液を排液するための第 3 の排液槽、22d は仕切り部材、27a、27b は異なる液を個別に回収するための回収ドレインである。その他の符号は上記実施形態と同様である。なお、図 7 の構成において、各気体取り込み口 32a、32b、32c の径 R を略同じに形成することで、これら各気体取り込み口 32a、32b、32c と雰囲気遮断部材 60 との間の隙間を、全ての気体取り込み口 32a、32b、32c で略同じにでき、気体の流入条件を略同じにして処理することができる。また、気体取り込み口 32b、32c の鉛直方向の間隔 ZL2 を気体取り込み口 32a、32b の鉛直方向の間隔 ZL と略同じ ( $ZL \approx ZL2$ ) に形成することで、スピンチャック 1 に保持された基板 W の高さ位置 HB に各傾斜部 31a ~ 31c を位置させるように案内部材 30 を昇降させたとき、雰囲気遮断部材 60 の高さ HL を維持 (スピンチャック 1 に保持された基板 W の上面と雰囲気遮断部材 60 との間隔を WB に維持) していても、各気体取り込み口 32a ~ 32c と雰囲気遮断部材 60 の高さ方向の位置関係を略同じにして雰囲気遮断部材 60 を配置させることができ、気体の流入条件を略同じにして処理することができる。従って、このように構成すれば、各気体取り込み口 32a ~ 32c ごとに雰囲気遮断部材 60 の高さを変える必要がなく、雰囲気遮断部材 60 の接離制御が簡単になる。

【0070】また、図 7 と同様の構成によって 4 種類以上の液を分離排液する装置を実現することもできる。

【0071】さらに、本発明は、2 種類以上の液を分離排液する機能を備えない装置にも同様に適用できる。この場合には、図 8 に示すように装置を構成すればよい。

【0072】なお、上記実施形態では、基板 W に洗浄処理を施す装置を例に採り説明したが、本発明は、その他の処理液を基板 W に供給して所定の処理を基板 W に施す各種の基板処理装置にも同様に適用することができる。

【0073】また、本発明は、半導体ウエハに対して処理する装置に限らず、液晶表示器用のガラス基板やフォトリソ用のガラス基板、光ディスク用の基板などの各種の基板に対して処理する装置にも同様に適用することができる。

【0074】

【発明の効果】以上の説明から明らかなように、請求項 1 に記載の発明によれば、案内部材の気体取り込み口の中央部分を塞ぐように雰囲気遮断部材を配置させた状態で基板に処理液を供給して所定の処理を施すように構成したので、気体取り込み口と雰囲気遮断部材との間の狭い隙間から取り込まれた気体の流速を比較的速くすることができ、処理液のミストなどが基板に再付着するのを抑制でき、処理の仕上がり精度を向上させることができる。また、基板保持手段に保持された基板の高さ位置に、上方に向かうほど径が小さくなる傾斜部を位置させて基板に処理を施すように構成したので、傾斜部から基板への処理液の跳ね返りを抑制することもできる。従って、基板への処理液の再付着を軽減して処理の仕上がり精度を向上させることができる。

【0075】請求項 2 に記載の発明によれば、排液槽とその周囲に設けられた排液槽とを備えた受け部材を設けたので、処理液のミストを排液槽に止めておくことができ、処理液のミストなどが基板に再付着するのをより確実に抑制することができる。

【0076】また、昇降手段を、基板保持手段及び受け部材に対して案内部材を昇降させ、装置内で昇降変位させる部材を最小限にするように構成しているの、案内部材に対して基板保持手段を昇降させたり、案内部材と受け部材の機能を備えた部材を基板保持手段に対して昇降させるのに比べて、装置構成が簡略化でき、装置のコンパクト化が図れるとともに、昇降手段の構造を簡単にすることもできる。

【0077】請求項 3 に記載の発明によれば、案内部材は、互いに間隔をあけて同芯状に配備された各種の処理液に対応した複数の傾斜部が形成されているとともに、最も内側の傾斜部の下方と、各傾斜部の間の隙間に形成される排液案内流路の下方とにそれぞれ排液口が設けられ、かつ、各傾斜部の上端部の気体取り込み口の径が略同じに形成され、昇降制御手段は、基板保持手段に保持された基板の高さ位置に、その基板に供給する処理液の種類に対応した案内部材の傾斜部が位置するように昇降手段を制御するように構成したので、複数種類の処

理液を分離排液することが可能となり、そのように複数種類の処理液の分離排液が可能な装置において、基板への処理液の再付着を好適に抑制することができる。

【0078】また、案内部材の各傾斜部の上端部の気体取り込み口の径が略同じに形成されているので、案内部材の各気体取り込み口と雰囲気遮断部材との間の隙間を、全ての気体取り込み口で略同じにでき、気体の流入条件を同じにして処理することができる。

【0079】さらに、各種類の処理液を別々の傾斜部、排液案内流路、排液口で排液でき、各液が混ざって排液

【0080】請求項4に記載の発明によれば、排気槽とその周囲に同芯状に設けられた各種類の処理液に対応する複数の排液槽とを備えた受け部材を設けたので、複数種類の処理液の分離排液が可能な装置において、処理液のミストなどが基板に再付着するのをより確実に抑制することができる。

【0081】また、昇降手段を、基板保持手段及び受け部材に対して案内部材を昇降させるように構成したの

【図面の簡単な説明】

【図1】本発明の一実施形態に係る基板処理装置の構成を示す縦断面図である。

【図2】案内部材を昇降させる昇降機構の一例の構成を示す正面図である。

【図3】実施形態に係る装置の制御系の構成を示すブロック図である。

【図4】実施形態に係る装置の動作を説明するための図であって、スピチャックに対する基板の受渡しを行う\*

\*状態を示す縦断面図である。

【図5】実施形態に係る装置の動作を説明するための図であって、薬液洗浄処理の状態を示す縦断面図である。

【図6】実施形態に係る装置の動作を説明するための図であって、リンス処理及び乾燥処理の状態を示す縦断面図である。

【図7】3種類の液を分離排液するための変形例の要部構成を示す縦断面図である。

【図8】液の分離排液を行う機能を備えない変形例の要部構成を示す縦断面図である。

【図9】従来装置の構成を示す縦断面図である。

【符号の説明】

1：スピチャック

6：電動モーター

21：受け部材

23：排気槽

24a、24b：排液槽

26：排気口

28a、28b：排液口

30：案内部材

31a、31b：傾斜部

32a、32b：気体取り込み口

45：昇降機構

50：制御部

60：雰囲気遮断部材

67：接離機構

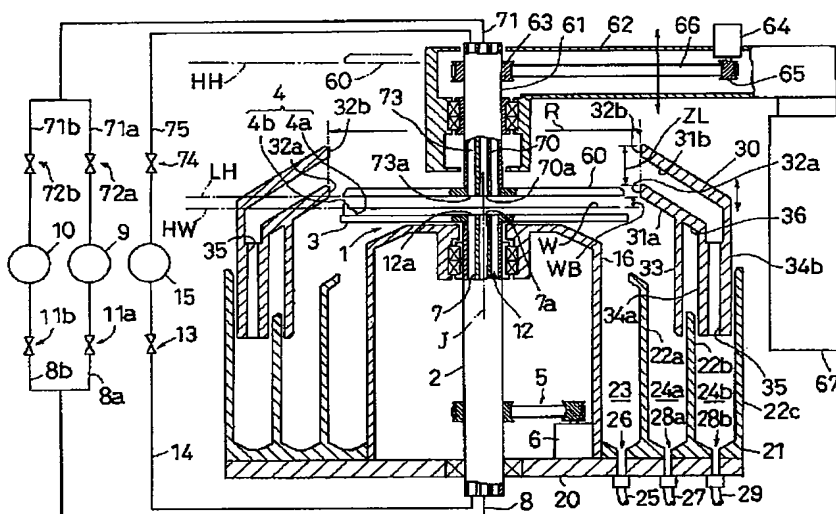
70a：洗浄液供給部

W：基板

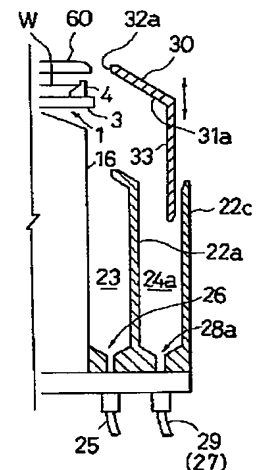
HW：スピチャックに保持された基板の高さ位置

WB：基板処理時の基板上面と雰囲気遮断部材との間隔

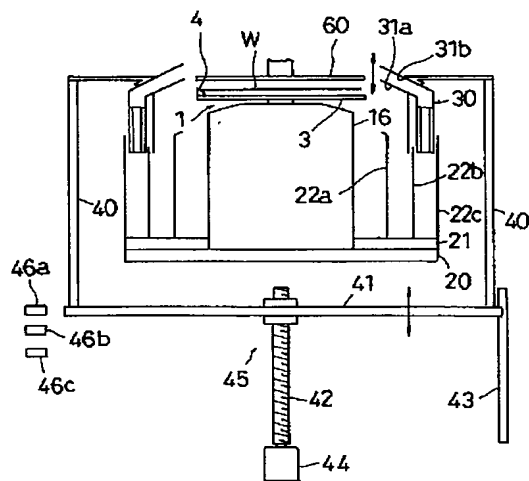
【図1】



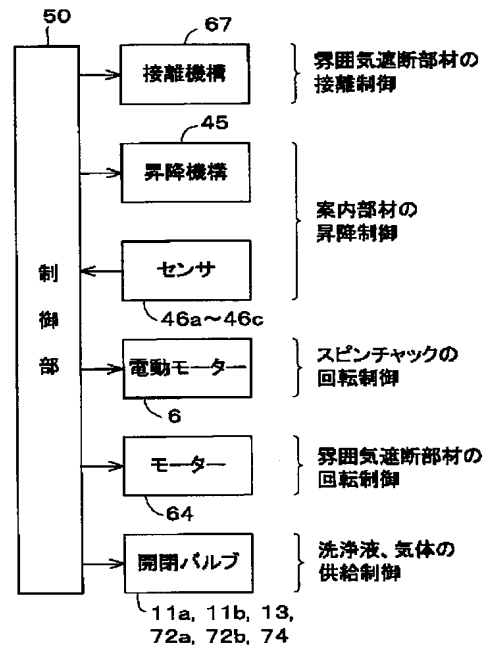
【図8】



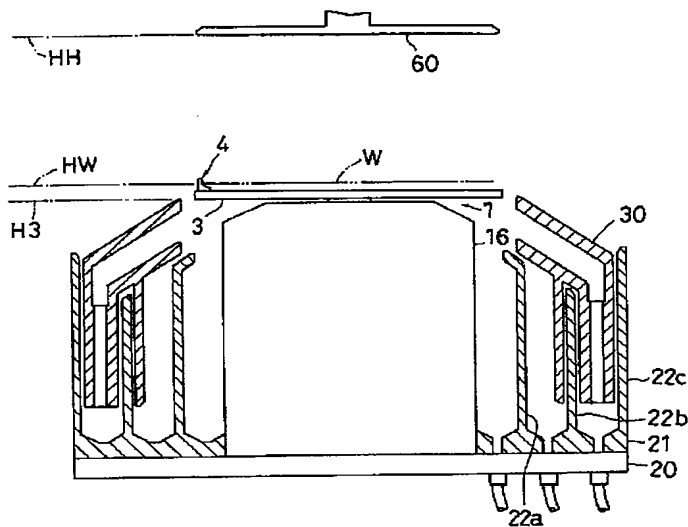
【図2】



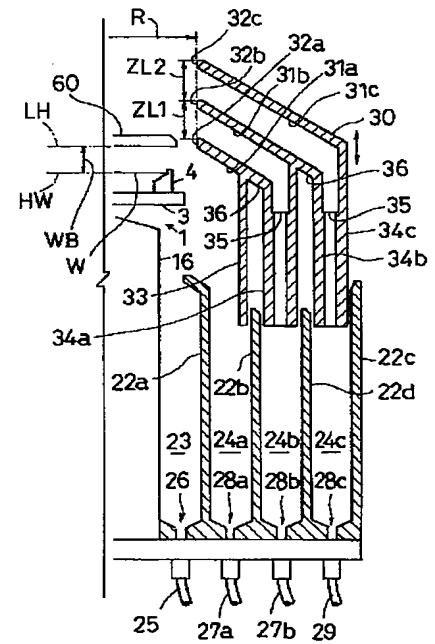
【図3】



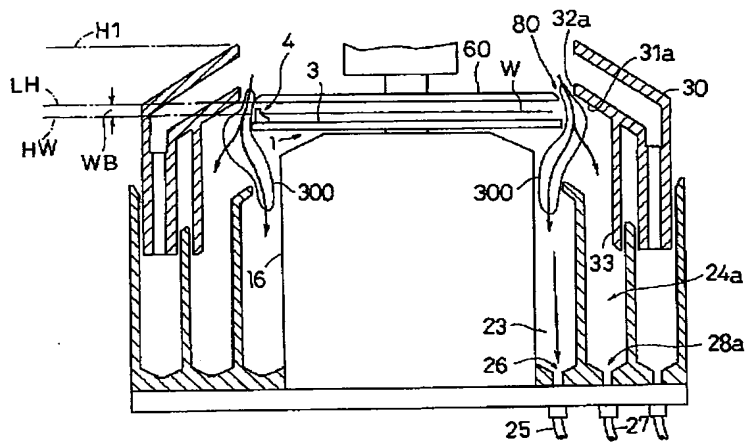
【図4】



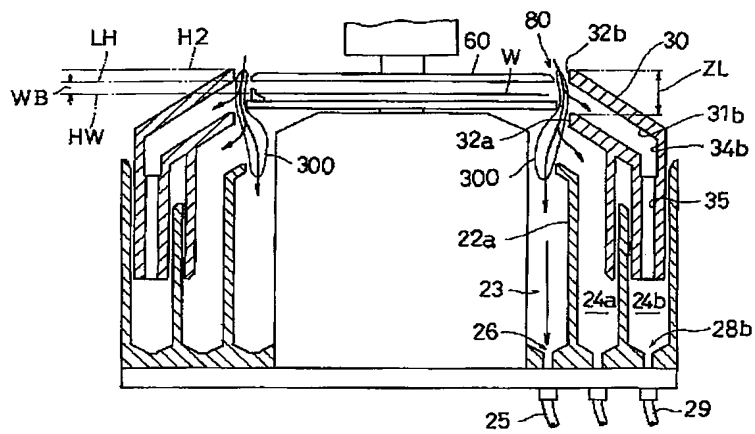
【図7】



【図5】



【図6】



【図9】

